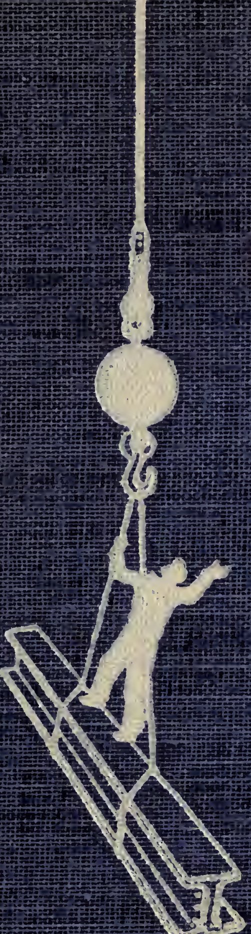

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ADVENTURES IN STEEL

by Lavinia R. Davis

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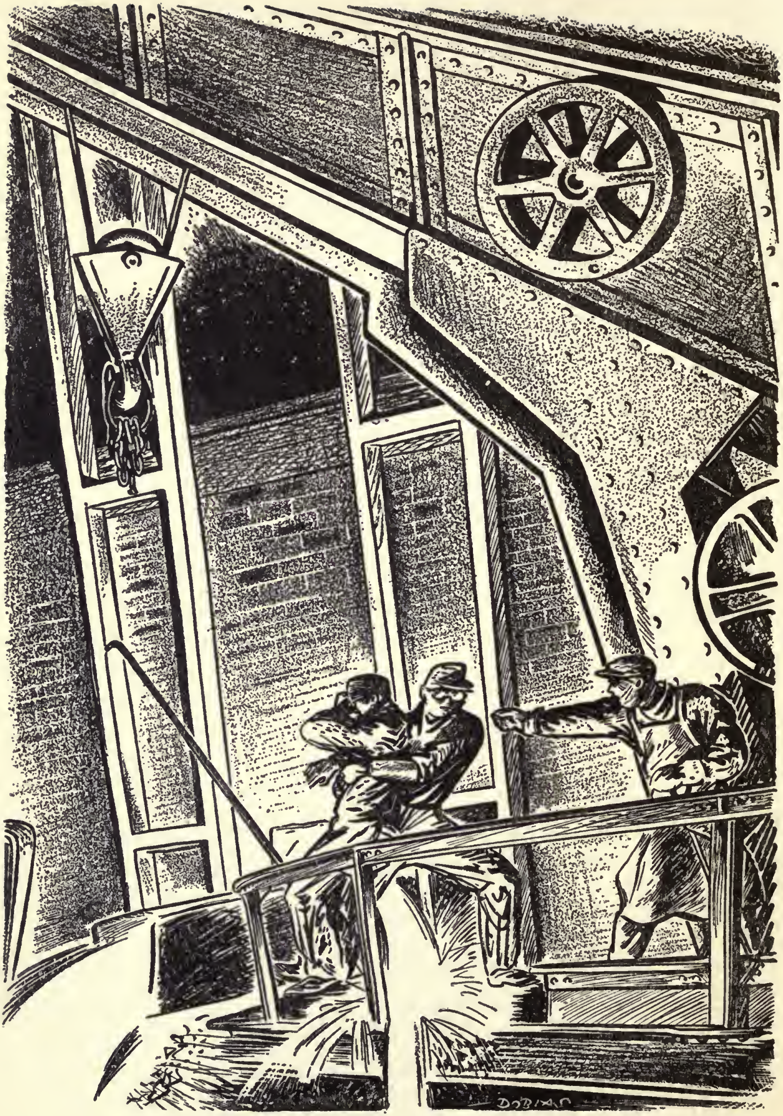
KEYS TO THE CITY



Pete half-carried, half-hurled him across!

ADVENTURES IN STEEL

BY LAVINIA R. DAVIS

ILLUSTRATIONS BY FRANK DOBIAS

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ADVENTURES IN STEEL

STEEL

Making of a Metal

STEEL is the backbone of our age. It is the strength in bridges, the erectness in skyscrapers, the shining speed in curving miles of railroad track.

In the city, steel is on every hand. In the buildings, in the streets, in the trains that roar and rumble under and over those streets. In the tools of the city's workers, in the pens of clerks, in the cars and trucks that crowd the thoroughfares.

In the country too, on the loneliest farm, steel has its place. The shining plow that turns back the deep furrow is of steel. So is the axe that clears the forest, the saw, the wheel, the chisel, and the plane. Even the simplest house and the one-room school are held together by steel nails and screws. Our very clothes are woven on a loom of steel and sewed with a steel needle. At night we rest on bedsprings of steel and in the daytime eat food that was prepared with a steel knife.

Steel is the most useful of metals because it can bend, stretch, be pulled relentlessly, and still not break. Steel can be spun into cables that will hold a bridge black with traffic. It can be flattened into thin, gleaming sheets;

pointed miraculously into the sharpness of a surgeon's scalpel.

Steel is a challenging metal. It is hard, yet can give, and twist and change its shape and its very being, before it cracks. It demands as much of the man who would conquer it. To make steel, men need skill, knowledge and a courage of which lesser ages did not dream.

From the first step to the last the progress of steel is along a hard and fiery road. First the iron ore is mined from the red earth. The ore is shipped by train or boat to a blast furnace. There, when ore and fire meet, the making of a metal is begun.

The ore is placed in the furnace with limestone and coke. Coke, which is made of bituminous coal, will burn at a terrific rate especially when it is fanned by hot air as it is in a blast furnace. While the fire grows hotter and hotter the limestone attracts, or mixes, with the dirt, sand, or other impurities in the ore. When the furnace is finally tapped the molten metal which pours off is called pig iron and the remainder which has mixed with the limestone is called slag.

Running a furnace sounds mild enough—unless you are within five miles of it. Then you can hear and feel the shuddering snort valve that echoes and re-echoes in the distant hills.

Iron making is an art, a job, a science. The nearer the metal is to completion the hotter and harder the work of making it. When it is time to draw off the pig iron, four men work furiously at the base of the furnace. They rake away the clay from the tap hole with long, heavy pokers. They work fast. Minutes are precious and men do not linger when their hands are blistering.

Suddenly the smoke, reeking of sulphur, belches from the tap hole. The heat strikes your face, neck, hands. Stand back! A rushing mountain stream of molten metal is on its way.

There is a trench to the left for the burning slag, one to the right for the pig iron. The stuff is a bright cherry-red and bubbling, boiling, choking with heat.

As the pig iron rushes out of the tap hole the searing heat is felt fully thirty feet away. Your eyes sting from the glare, your skin dries and tightens. Move back, rush back, run! Anything to get away from this demon's fire. But look once over your shoulder. There are still four figures silhouetted against the brilliance. Four workmen who *must* stay near that terrible fire.

In a few moments it will be over. The pig iron will be carried away in round conveyors called submarine cars; the slag will be moved off for disposal. But a few moments can be an eternity when your eyes burn, your skin crawls, and every inch of your body pleads for cooler air.

The blast furnace is only the first stage and its crew are only a few of the men who must sweat and slave in the volcanic job of making steel. Pig iron has only begun its apprenticeship to fire. From the blast furnace it goes to the open hearth furnace and in that roaring imitation of hell is converted into steel.

The open hearth crews have as hot a job as the blast furnace men. The melter and first helper stand on the upper level of the big, dark, barnlike building on what is called the charging floor. In front of them is the furnace with a great open peephole glaring out into the gloom like an evil eye. Through this hole the men stir the fiercely flaming iron as it turns to steel. The heat from the peephole is terrific, the light blinding, and the sound like the rumbling of a storm.

Every little while the melter must take a test of the mixture. He shoves a long-handled dipper called a spoon into the furnace. He draws it out almost immediately but in that moment it has become a clear red and glowing with heat.

The sides and part of the handle of the spoon are covered with slag that looks like red, glistening icing. The melter strains to hold the spoon steady against the peephole while his helper knocks off the slag with a sledge hammer.

"Hold it, buddy," the helper says and lifts his hammer.

Hold it, buddy. Don't flinch though your muscles tear and your face is in torment from the heat. Hold it, buddy, though sparks the size of quarters fly through the air. Hold it, buddy, for you only move to danger. What if you should bend nearer that hammer, that crashing hammer, and your helper, blinded by the furnace, let it fall?

Once the slag is knocked off, the ladle is poured into a small mold. The mold is quenched in water and taken to the laboratory to be tested. If the test is satisfactory and the steel has enough manganese in it and not too much sulphur and phosphorus, the "heat" or furnace load of metal can be tapped.

The tapping is done from a little balcony on the lower or pit side of the building. The men stand just above and to one side of a chute running into a huge ladle into which the steel will be poured. The second helper rakes away the clay and then jumps to one side as the roaring metal pours by. The second helper moves, but not very far. If the steel is to have aluminum or silicon in it, this has yet to be added. The worker stands a terribly short distance from the cauldron full of boiling steel and throws in his chunks of metal. Then, and only then, though the rafters quiver with the heat, is the steel ready to be moved by a giant overhead crane and poured into the ingot molds that are waiting on a flatcar nearby.

From the open hearth the ingot of steel usually goes to the soaking pit. This is a gas furnace into which the ingot is dipped by enormous mechanical pincers. When it is white-hot the ingot is placed on rollers and travels directly to the blooming mill where it will be rolled into shape.

In the old days the work in the blooming mill was even harder than it is now, for the great pieces of hot steel had to be moved by hand. It is still no sinecure, although the ingots are rolled mechanically. Anyone who spends all of his working day near the steel that is white-hot needs to have the skin of a rhinoceros and the heart of a lion.

At the mill, the steel is rolled into shape. If it is to be used for building it will be rolled into long columns to go up and down, and beams and girders to go crosswise. Perhaps when a beam is taken off the rolls, it will have a slight surface imperfection. If it has, the chipper will be called in to work on the beam with his pneumatic chipping hammer. He will gouge out the imperfection and then the space will be filled in by electric welding.

The chipper is a man worth watching. His trade requires a straight eye and a strong hand. He must withstand the shattering vibrations of his hammer and the flying splinters of steel which surround him. He wears goggles over his eyes and heavy leather gloves to his elbows. His work is hot, dangerous and exhausting but he does it as though he were kneading bread. He is so used to danger that he is no longer aware of being brave.

Throughout its creation, steel, like every other pagan god, demands burnt sacrifice. Nothing can be done with steel save by sweat and fire. Steel cannot be worked unless it is soft with heat or undergoing terrific pressure.

Man could not really master steel until he could build and tend fires as hot as miniature suns. And fire alone is not enough. The blacksmith must beat the horseshoe on his anvil and the mill hand roll the plate beneath his giant press.

Day in and day out the steel worker stands beside reeking roaring furnaces that are so hot that the skin of his face tightens as he moves nearer the blast. In summer the whole mill will be quivering with heat. In winter the workman will roast near his furnace and shiver away from it.

Along with the heat the steel man must stand noises that are like the shriek of demons consumed by fire. He must work for hours at a stretch undismayed by heat or clangor. He cannot afford to tire while he is on the job. Steel is a relentless metal, and in its making and using there are many traps for the unwary.

Whether he works in a mine digging the iron ore, in furnaces turning the iron to steel, or in the sky riveting the beams of a steel skyscraper, the worker needs his strength and his courage. The maker of steel must be greater than steel. His mind must be quick and alert, his body powerful and untiring. Above all, his heart must be the master of his metal. It must resist fire without burning, toil without tiring, and danger—constant danger—without fear.

OPEN HEARTH

WIN BENNETT looked out of the window of the parlor car. The green, prosperous countryside rolled gently westward beneath him. Then suddenly, near the river there was a long, ugly scar of buildings, furnaces, towers, and chimneys. The Atlas Steel Mills, imbedded in smoke, could be seen and heard for miles.

An hour later Win followed a brisk, staff secretary across the mill property. Even before they were near the shabby armory-like building that housed the open hearth, the noise of the wheels, whistles, and escaping steam was deafening. Win shrugged his shoulders. It hadn't been his idea to come in the first place. He'd had a perfectly good plan to go abroad with two of the boys in the club up at college. Then Uncle Jeff had put on the screws and sent him to work for the Atlas Steel Company for a summer.

They went inside and Win stared at the great, gloomy cavern where he was to begin work. One side was open to the air, the other walls were black and sooty. Win looked up and saw that there was a half story jutting out across the way from them. Win and the secretary stood on the cindery ground floor where they could look up at the dark backs of the furnaces on the half story above.

There was a small, precarious, steel balcony hanging from the half story near the back of the furnaces.

Win wondered idly what the balcony was for, but just then Llewellyn, the big Welsh foreman, came up to greet them. Llewellyn held out a large, gritty hand that pressed coal dust into Win's palm, and told him to report for work the next morning at seven. The man was ready enough to talk, but Win was in no great hurry to hear about work. Hadn't he just finished cramming for exams?

Outside of work, John Llewellyn didn't seem to have much to talk about. "Remind them to show you about the water cooler," he said and walked off. Win grinned at the secretary. Imagine reminding anybody about a water cooler. Did they think he was so dumb he couldn't get a drink for himself?

As they left the open hearth building, Win looked around, vaguely curious. He'd never seen a steel mill before except from the train. He realized for the first time that the windows of the office building in front of the plant were translucent so that no one could see the mill from there.

"I've got to get back," the secretary said. Win nodded. Time enough to see the works tomorrow. In the meantime he had to find a place to live.

It didn't take long to choose a place to live because there were only two available. Win took the one where he was offered a bed to himself and went out to the movies. The movie was a Western and poor at that, but what really depressed Win was the audience. He looked at them as they all strolled out at the end of the movie and decided that there wasn't one interesting face in the crowd. Shapeless women dragging sleepy children, seedy-looking men, and big brawny swains in store suits that didn't fit. Discouraging prospects for company for the next three months.

The night in the boarding house didn't exactly add to Win's peace of mind. The bed was lumpy, there were no sheets, and the night was punctuated by blasts of sound from the plant. An especially loud whistle at six found Win already up and climbing into work clothes that were stiff with newness. He ate the extremely poor breakfast his landlady offered him and went out into the street. Even that was not comforting, although it was a soft June morning, and the air was balmy and relaxing. There was a thick smoke cloud overhead that poured out from the factory and spread itself over the town like a gray, vaporous mushroom. Very soon, in his spare time, Win promised himself, he would walk outside of the town beyond that pall of smoke.

He reported at the entrance to the plant at seven sharp but Llewellyn and the others were already there. "You help Polowski," Llewellyn said. "He's the melter." He indicated a tall, solemn-looking Pole with immense shoulders. "The other chap's Jake Davies, his first helper." With that Llewellyn walked off.

Polowski looked at Win through round blue eyes that were red at the rims. "So little a man as you can work in the furnace?"

Win managed to keep his temper.

Polowski said nothing more and he and his first helper went into the building with Win behind them. They walked across the pit floor where Win had stood the day before, under the balcony, and climbed up a rickety ladder to the half story.

"This is charging floor," Polowski said, speaking with a thick, guttural accent.

Win couldn't speak. He could only see and hear. The noises that he had heard yesterday were doubled. Across the black, cindery floor loomed the round domes of the open hearths with great, red eyes of fire staring toward him. A steam whistle went off at Win's elbow and he jumped.

Jake Davies grabbed his arm. "Don't jump that way," Jake said. "Around here it ain't safe to move without looking." Win looked up, and understood. A huge traveling crane with a man in the control box was shuttling by overhead. Exactly where he had been standing, a big grappling hook thudded along over the floor. Win looked up into Jake Davies' lean, lanky face and nodded his thanks.

Another shrieking, shuddering blast cut the thick air and again Win jumped. Two men had come up the stairway from the pit floor just in time to see him jump. "The kid's got noives," one of them sniggered.

"That's Pete Hanover, the second helper," Polowski said. "The other man is Magaryk, the slagger."

Win looked at Pete Hanover, suddenly curious as to what kind of men worked in such a place. Pete was short, with broad knotty shoulders and ape arms. His face was humorous and not unfriendly, but Win had no time to speak, even if he could have made himself heard. Pete and the slagger walked around to the back of the furnaces to the balcony that Win had seen from the pit floor and disappeared.

Polowski and Jake walked over to the bright peepholes of the furnace and Win, hating to be left alone, followed them. They waved at the night crew that was leaving, snapped on their goggles and went to work.

"We test," Polowski said and indicated that Win was supposed to help him manage the long steel dipper. "You grab end of the spoon," he said and Win grabbed.

They came so close to the furnace that Win's skin tightened and his eyes were in agony. What were they going to do? They couldn't go close enough to dip out some of the boiling metal in that spoon? The place was already hotter than anything Win had dreamed a man could stand. Hotter and noisier. Win walked forward, slowly, heavily, holding on to the handle behind Polowski, then he half-tripped on the rough dirt of the floor. "Don't trip here!" Jake Davies plucked him by the sleeve for the second time. "It ain't healthy."

"Get up, Clumsy Foot," Polowski said. "Let go of spoon if you can't stand up. Want we both should fry?"

Win let go of the handle. He stood watching, his eyes seared by the heat, while Polowski carried the dipper forward. Polowski's shoulders arched. He handled the long steel dipper as lightly as though it were a plumed pen. His face as he worked was as hard and tense as iron. He lunged the spoon right into the peephole of the open hearth and brought it out instantly red and glowing.

He thrust it back so the head of the spoon rested against the edge of the peephole and nodded to Jake.

"Stand back," Jake shouted above the roar of the fire. Win stood!

Jake lifted a huge hammer and swung it against the handle of Polowski's spoon. There was a shower of big burning sparks. One bit Win's cheek and another stung his lip. He shrank further back but already he was three feet behind Polowski and Jake. Jake worked furiously, beating off the burning slag. Polowski said nothing, while he strained to hold the hammer.

In a moment they were through and Polowski emptied the dipperful of metal into a small mold near Win's feet. "Quench it and take it to the laboratory," Jake said. "The water trough's right over there." Hesitatingly, Win took the tongs Jake handed him and picked up the red-hot mold.

He walked toward the trough of water. Holding the mold carefully, lest it should slip, he dipped it in. Instantly the red began to fade. The water around the metal boiled. He lifted out the gray mold and carried it to the door that was marked LABORATORY. A man in a brown shirt took the mold from him and shut the door. There was nothing for Win to do but go back to the furnace.

"Now we stir," Polowski told him when he got back. "A goot job for a starter."

He gave Win a long steel rod and indicated the peephole. "Stir all around edge for clinkers," he said. "And then throw the pole."

Win nodded and walked forward carrying the heavy pole in both hands. He couldn't fail now before he'd really begun. He couldn't be scared before he'd started. The overhead crane clanked past behind him, a steam whistle roared, and Win knew he *was* frightened. All the time the fire, the furious terrible fire, was there ahead of him. He had to go close enough to stir the boiling metal at the heart of that fury.

Win put the pole into the peephole awkwardly and began to move the end of it. "Closer," Jake and Polowski said as one. "You can't do it at long distance."

Win's face stiffened and his eyes stung. The heat was incredible, frying his body, and searing his mind. He was going blind! His brain reeled with heat.

"Closer," Jake yelled above the million noises of the plant. "Closer, you dope, and throw!" Win took one step closer and felt his skin tighten. He stirred feebly with the hot stick and felt it caught in the whirling mass of steel.

"Now throw!" Jake's voice seemed a long way off, but Win threw. He lunged the rod of steel forward like a lance. Almost before it had left his hands, the lance of steel was consumed in the boiling mass of metal.

Win clapped both hands over his aching eyes and dashed back. Polowski beckoned to him. "No time to rest now," he said. "Go find out about the test."

Win walked across the rough floor, his eyes red and streaming. The work was not only hot but heavy. Heavier than any work he'd ever tried in his life. His arm still ached from the weight of the pole.

The moment Win came back from the laboratory with the report of the test, Jake handed him another stirring rod. When the agonizing labor of stirring was over, they made another test. This time Polowski made Win hold his share of the weight of the spoon.

Win was so hot the sweat ran from his face and from every inch of his body under his thick clothes. Once when Llewellyn came by, Win asked if anyone had an extra pair of goggles. The men shook their heads, their faces like some hot impersonal gargoyles in the firelight. "Each man brings his own," Llewellyn said. "If you'd bothered to look around yesterday, you'd have known."

Hopelessly, Win went back to work. By three o'clock he would be blind. Then he had an idea. He would go out and buy goggles during lunch hour. It was his only hope. But nine o'clock stretched itself slowly into ten, and ten dragged toward eleven. Polowski and Jake opened their lunch boxes about twenty yards back from the furnace, and Pete and Tracey joined them from the pit side.

"Don't you go out?" Win said. "Don't—don't we get time off for lunch?"

The others looked at him and Pete Hanover laughed. "Act your age, Simple," he said. "What do you think this is, a sewing circle? Eight hours means eight hours. We're on duty the whole time. We eat on the run."

Win sat down on the gritty floor and ate his thick sandwiches with filthy shaking hands. It was a nightmare. He wondered if he could last out the day without goggles?

Work went on much the same way after lunch as before. Win became a little more used to the sounds, but his muscles were tired now and ached more than ever. These men were used to lifting hundred-pound rods of steel, but Win hadn't pushed anything heavier than a squash racket all winter. He'd taken exercise but this was something else again. He looked at the men and for the first time realized that their muscles were stronger than his because they had developed them through these terrific tasks. They worked him hard, but they worked harder themselves.

It was just two o'clock when they were ready to tap the furnace to let out the boiling steel. "You go on the pit side with Pete," Polowski said to Win. "Maybe he need help."

Win went out on the little, sloping balcony behind the furnaces and stood next to Pete. The balcony stretched out for about twenty feet over the pit floor. Just beyond the farther end of the balcony was a wide trough or chute leading from the mouth of the furnace to a huge ladle. "When we tap," Pete said, "the steel flows from the furnace down the trough into the ladle. Then the crane takes the ladle over to the ingot molds waiting on the flatcar there and the steel's poured into the molds."

Win looked down at the ordered wilderness of the pit floor. The farther side was crisscrossed with railroad tracks. Directly below him, were uneven waves of cold slag and a little farther along by the end of the balcony yawned the waiting, open ladle.

Pete Hanover started to work and waved Win to get back. Win moved to the end of the balcony farthest from the furnace and the ladle and watched Pete work. Pete had a long hooked poker and he raked away clay and dolomite from the bottom of the furnace. As he pulled loose the hot coals, another man shoveled them away. Their hot, tense faces were very tired. Pete swung at his work with a long sweeping stroke. Once he stopped for a moment and rubbed his aching arms.

Pete saw Win staring at the other man. "He works on the next furnace," he explained. "When we tap he shovels for me. When they tap I'll shovel for him."

Pete began to rake as fast as he possibly could. As he worked the red coals rattled down the chute and were shoveled away. "She's a-coming," Pete yelled. Win could feel his heart beat faster and faster. "She's a-coming! NOW!"

Pete jumped back, his hands over his face. There was a blinding belch of smoke, a crackling roar of fire! The red, choking fury of steel began to run into the ladle. "We've got to move," Win shrieked. "I'm—I'm frying."

"Fry then," Pete said grimly. "This is just a starter." He reached down and picked up some chunks of cold metal that lay behind Win. "Aluminum and silicon," he roared. "They go into this heat to make it the proper alloy. *You* throw them!"

Win crouched back, but he could not escape. Below him was the ladle filling with the writhing, whirling liquid fire. Behind him was the furnace and the chute to the ladle. The only way out to the charging floor was blocked by Pete, his body big and threatening in the gruesome light.

Pete tore off his goggles and threw them at Win. "Put those on and throw!" he shouted.

Win jerked them on and the edges were so hot they hurt his face. With shaking hands, he lifted the blocks of aluminum. He moved toward the inferno. "Nearer!" Pete yelled. "Nearer, or you'll never get them in."

Win took one step forward, two. If a man slipped once over that fearful fire! One false step on the steel balcony and he would plunge into that ladle. Win's heart contracted. His body, his mind, his spirit were burning. No man could stand such flame. No one. He lifted his blocks of aluminum and threw.

"Further, you chump," he heard Pete roar. He saw Pete lift the remaining blocks, run toward the fire, hurl them in, and race back. Win looked up at him, swayed, and then suddenly everything whirled blackly and he crumpled at Pete's feet.

When Win came to, he was lying out of doors, just outside the open hearth plant. John Llewellyn and Pete were bending over him. For a moment as he wavered toward consciousness, Win thought their eyes, deep-set in their blackened faces, were worried and kind. Then when he was fully awake he saw they were hard, and impersonal as they had always been.

"It's the heat," Llewellyn said. "And the sweat. It takes all the salt out of your body. That's why we take salt pills every time we drink. I told you to find out about the water cooler."

Win stood up, his legs as shaky and unreliable as a new colt's. His head swam, his body trembled. "It's time to go," Pete said. "The next crew has come." He looked at Win with a sarcastic, questioning expression on his face. "Will you be here again tomorrow?" he said. "Or can't you take it?"

"I—I'll—I'll be here," Win got out. "Of course I'll be here."

"I've known strong men who didn't last out a month," John Llewellyn said. "Let alone a whole summer."

Win looked at him. "I'm going to last out the summer," he said slowly. "I'll bet you this year's wages against a job for next year that I stick."

"Done," said John Llewellyn. A few minutes later Win started shakily for home.

That night was worse than anything Win had ever experienced. He turned away from the thought of those red shimmering fires only to hear the blast furnace bellowing across the road. Once he got up and leaned out of the window for cooler air, but across the way, half a mile from the house, the night sky was red and smoldering over a newly piled heap of hot, waste slag.

Win pulled his head in and began to write to his mother. Perhaps if he told her about the day he had just been through, he could get it off his mind, or at least forget it long enough to sleep.

The next day Win pulled himself to work. "Well, look at who's here," Pete Hanover said. "I never thought to see you again."

Win said nothing, and fell to work helping the men charge the furnace with molten pig iron and ungainly piles of discarded scrap. Mentally he checked off one day in his mind. Three months seemed as long as world without end.

But by the end of two weeks, life was a little more bearable. Win knew enough now not to jump at the shrieking valves and whistles. He could duck the overhead crane without looking up. He found order in what had seemed chaos two weeks before. Even in the fires he saw reason and power. When the furnace was tapped and the steel came rushing forth, there was a crude sort of glory he learned to admire.

Where he had been sickened with fear his first few days, he now was confident, almost airy. His muscles still ached with weariness in the evening but he no longer feared he might faint of the heat. He no longer worried about his relationship with the men. Pete Hanover, whom he saw the most, was still difficult. He didn't go out of his way to be disagreeable but neither did he ever try to be pleasant. Well, it didn't particularly matter. There was work to be done and Win could do it. For the first time he realized that not all of life was planned for continuous sociability.

During his third week at work, Win and Pete Hanover were beginning to tap the molten steel from the furnace when Win offered to take the poker away from Pete and do the job. "Go ahead," Pete said, "but he careful how you pull it. If you pull it over to one side she may cause trouble."

Win said nothing. He hadn't been watching this operation for three weeks for nothing. What did they take him for, a fool? It might take some dumb cluck from the country a year to learn but it wouldn't take *him* long. He understood the chemistry of steel making.

Win scooped away the slag in a reasonable imitation of Pete.

"Pull it away from the middle!" Pete said. "The middle, you fool, not the side."

Win was furious. He jerked angrily at the coals without giving Pete time to scoop them up with the shovel. What did Pete think he was? He scooped again and felt Pete's hand on his arm. He jerked free and scooped again at the growing center of heat. He'd show them!

What happened next, Win was never quite sure. The last barrier of clay and dolomite crumbled. The molten steel rushed out with a roar like a breaker. The smoke was blanketing, and sparks like stars fell in all directions.

Suddenly Win saw the flow of steel separate. He had not pulled out the clay straight nor let the ashes be taken away. Now the piles of ashes were splitting the stream of steel. There was a trickle, a ripple, a growing freshet of hot steel moving off the chute and spreading across the balcony.

Win looked across at Pete and was suddenly petrified. A wide ribbon of fire separated them and fell over the edge of the balcony. Win could feel the skin on his face blister and at the same time he saw Pete hurdle the flying fire. He felt Pete's tremendous arms around him and then Pete half-carried, half-hurled him across!

In a few minutes, the steel was cooling in a gray, uneven pool in the pit below the balcony. The other workmen were congregated around Pete and Win; and Llewellyn was slapping oil on them both indiscriminately.

"How'd it happen?" Win said. "It came so fast."

"You bet," Llewellyn said. "Hot steel moves like lightning. If it's not tapped right, it'll flow out wherever it can."

Win looked at Pete. "You knew that," he said, "and you tried to stop me."

Pete looked down at his red hands and shrugged immense shoulders. "Everybody slips up sometimes," he said.

For a moment Win said nothing. "And after that, you pulled me across. You might have been fried yourself."

Pete looked as though the words cost him more embarrassment than the fire. "Aw, can it," he said. "It didn't do anybody much harm. Just a few blisters."

Win gingerly touched his blistered ankles and his red neck. Pete's hands were his only injury. They were both incredibly lucky, thanks to Pete. Win looked at him and held out his hand.

"If you hadn't jumped, I'd be cinders."

Pete grinned. "It's O.K.," he said. "And next week I'll shake hands when they've healed up."

John Llewellyn looked at them. "Will you be there?" he asked Win.

"Of course," Win touched his blisters. "These ought to be all right in a few days at most."

Llewellyn nodded slowly. "Well, I guess that job'll be waiting," he said. "A workman who gets burned and then comes back usually sticks."

When Win got home, he found a telegram from his uncle.

Your mother convinced me work too hard for her son stop if you want to chuck it trip abroad still open Randolph and Bacon want you to go with them.

Win went out to telegraph, careful not to bend his sore neck as he wrote the words.

Sorry have to stay here two years to collect a bet stop besides my new pals not the kind that travel.

He signed it,

Bennett
Care of Open Hearth Dept
Atlas Steel Co
Atlas
Pa.

IN THE SNAKE HOUSE

PETER RICHARDSON swung down the long slope of Huckleberry Hill that led to the bar mill of the Clay Steel Company. It was Peter's first day on the job and he was not looking forward to it at all. He'd had it all fixed that he was going to loaf for a month or two, then go to the Hilton Football Camp for four weeks before college opened. Coach Connors had as much as told him that there'd be a place waiting for him on the Hilton team if he could get the month's practice at camp.

Peter had a letter from Connors, the coach, in his pocket and now he crumpled it into a hard ball. He hadn't been home from college an hour before he knew football camp was out. His father was sick and would not be able to work for the rest of the summer. If Peter wanted to go back to Hilton at all he'd have to earn the money during vacation and that was just what he was starting out to do.

Peter had written the coach as soon as he'd landed the job in the steel mill, and it was Connors' answer that he now crushed in his pocket. Coach Connors had the nerve to suggest that Peter take exercises in his spare time. If he could keep up with his training program, Connors wrote, there might still be a place for him on the team. Peter threw the letter into a bramble bush and hurried the rest of the way down Huckleberry Hill. Didn't the coach recognize real work when he heard about it? Did he think that the job Peter had in the mill was another summer sinecure of teaching little girls to play tennis?

Peter looked at the streamers of smoke that came up from the mill in the valley beneath him. If Connors thought he was going to trot around the countryside after a day's work, Connors just didn't know anything about a steel mill. Not even as much as Peter knew from having watched other men come home, hot and exhausted, in the evening.

The next few hours Peter didn't have time to think about the coach, or Hilton football, or anything but work. He reported to Abe Davies, who bossed the bar mill, at five minutes of seven. At five minutes past seven, he was helping to lug a four-hundred-pound, red-hot billet of steel from the furnace to the first stand of the mill. Peter carried his end of the billet with a heavy pair of tongs. Abe Davies' son, John, worked beside him, and at the other end of the billet were the broad shoulders of Paul Patchok.

Peter could feel the sides of his legs itch from the heat of the billet. Even through the thick cloth of his work pants the heat was scorching. The sweat ran down his face and behind his ears.

"Stand back," Patchok said, and Peter moved out of his way. They were in a big room with a rough concrete floor. The whole place looked like a great garage with machines instead of automobiles at regular intervals. The bar mill was separate from the rest of the plant and was run as an independent unit.

Directly in front of Paul Patchok was a mill stand of about the size and general appearance of an ordinary turning lathe. In the center of it were rollers that reminded Peter of the laundry wringer in the kitchen at home. On various parts of the floor were similar mill stands with men standing at either side of each one of them.

"Let 'er go," John Davies said, and he and Patchok half-lifted, half-hurled the four-hundred-pound billet into the moving rollers of the stand. Peter held his breath. Suppose they missed their aim, and the billet didn't get between the rollers but bounced back on their feet! Peter drew back to watch them work. You'd only have to be burned by one of those billets once!

But John Davies and Patchok weren't worried. The minute the end of the billet was in one side of the roller, John Davies got ready to send it back. As the steel came through the mill stand he caught one end of it with his tongs, and half-pushed, half-heaved it back through the mill stand to Paul.

Peter held his breath. This time Paul had to step back from the rollers to catch his end of the lengthened billet. Each time the steel went through the mill stand it was stretched longer and longer, thinner and thinner. Paul had to move fast to catch it.

The third time the steel came through on John's side, it was about three inches wide and twelve feet long. It was still red-hot, and it twisted and turned in John's tongs like a red snake. He jerked it away from his machine with a twist of his strong wrists, and started the head of the snake into the next mill stand.

This time another pair of workmen caught, and returned the steel through their rapidly turning mill. They worked back and forth leaning toward one another like men using a two-handled saw.

"That's the pony stand," John told Peter. "This is the roughing stand. The one over there against the wall is the finishing stand. We're the spell crew, so we'll work 'em all before the day's over."

Peter could nod but he couldn't speak. The men at the pony stand had to move like a pair of ballet dancers. As the steel grew longer and longer, the mills rolled faster and faster. The men had to snap the red-hot steel back and forth through the rollers as fast as they could work.

Peter watched the steel as it shot out from the last stand. It was very thin now and traveling very fast. It was a long red arrow of fire shooting over the floor. "That's where they roll it up," John said. "Then it's shipped off to be made into screws and bars and what-have-you."

Peter saw the men at the finishing stand catch the red streamer with their tongs. They placed one end of it around a coiling machine that wound the slowly graying steel about itself. Another man lifted down an automatic carrying hook from the ceiling, levered the steel coil off the coiling machine, and onto the hook. In another minute he had swung the hook away to the back of the building and was ready for more steel.

John, Patchok and Peter carried another billet of steel to the roughing stand from the furnace. Then Peter stood back while John and Patchok rolled the billet between them. He admired them more than he'd ever admired any men in his life. They did just as much carrying as he did, had the extra work of slinging back and forth the hot steel, and yet found time to explain to him what was going on.

Peter watched the cycle of rolling and stretching again. When the final steel spewed out from the finishing stand, it shot forward with the spurt of one of those red paper blowers Peter's mother had once bought for his kid brothers. Peter grinned in spite of himself. Anything further from a kid's party than this would be hard to imagine. And yet the red steel dart did pop out with the same unexpected speed, the same incredible stiffness.

The rest of Peter's day moved slowly along. The work was harder than he had ever supposed, but more exciting, more spectacular. The men were heavy-set giants and most of them were friendly. Until he and Patchok and John Davies went to spell the men at the finishing stand, Peter had liked everyone with whom he had come in contact.

Peter arrived at the finishing stand before his two partners. While he was waiting for them he watched a dark boy of about his own age feed the hot metal into the finishing stand. The steel was very long now, and writhed at the boy's feet like a red-hot Christmas ribbon. He held the ribbon with his tongs in one hand, and whirled it about him like a matador whirling a cape. "Some stuff," Peter said as John Davies joined him. "He certainly can handle it."

John Davies grinned and the smile wrinkled up the skin of his pleasant, lean face. "That's Tony Pareto," he said. "He's good when he wants to be, but he's tough to work with. Gets touchy if you look at him."

Peter held his breath. Good? Tony Pareto was a miracle man and so were all these others who handled that whirling, frying steel.

The moment that Pareto saw John and Patchok beside Peter he let his last piece of steel go through the rollers and then threw down his tongs. "What's the big idea, keepin' a guy waitin'?" he demanded.

"It's all right, Big Boy," John Davies said coolly and pointed toward the clock. "We're ten minutes ahead of time."

Pareto strode off without another word. Peter looked up at him as he passed and saw that his eyes were bright and hard with anger. Peter stared after him. This boy wasn't just annoyed. He was really angry! "Nice guy," Peter said to Patchok. "But he seems to be in a hurry."

Patchok shrugged his shoulders. "He lika to be tough guy," he said in his stiff English. "His whole family lika that."

Peter would have asked more questions but just then Abe Davies came past. When Abe was around John and Paul worked twice as fast and they had no more time to talk.

The next day when Peter went to work he found that Huckleberry Hill was longer than he'd ever remembered it. He felt as though he had rheumatism all over. When he started working, his arms ached, and his legs, and the back of his knees. Abe Davies, John's father, watched him as he angled awkwardly for a billet that he was to help carry to the roughing stand. "That stiffness'll bake out in a day or two," Abe said grinning. "This here mill's a regular Turkish bath. Your soreness won't last."

Peter managed to laugh, and moved along carefully with his share of the glowing load. He didn't understand how anything could last in here, including the men. It was warm outside, but in the mill every draft of fresh air was burned up and the workers bathed in their own sweat.

The day was interminable; but somehow or other Peter managed to stick it out. He passed the two Davies' at the door and the older man said, "I didn't think you'd make it. Most new men would fold on a day like this."

Peter met his second test at the end of his first week at work. For the first time, when he and John Davies and Patchok went to relieve the men at work at the pony stand, John told Peter to try catching the steel. Up to then Patchok and John Davies had rolled the steel between them, first one catching and then the other. Peter's job had been to carry it between stands or to do extra errands.

This time John nodded to him to stand opposite Patchok. "You've got the idea, now," he said. "Take a hack at it."

Almost before Peter straightened up behind the mill stand, the steel shot out at him. He hesitated a fraction of a second, then dove for the end of it with his tongs. He caught it neatly. "Now put it through again," Davies shouted.

Peter looped back the thin red steel and shoved the tip of it into the hungry rollers. In a second it was sucked in and moving back toward Patchok again.

"Run back," Davies called, but Peter was already running. He'd watched this enough times to know that there wasn't any time to waste. He rushed back eight feet from the stand. As he got there the red snake shot out at him again. He caught it and sent it back to the rollers with a hard, straight-armed motion as though he were making a forward pass. "You're all right," Davies called above the whirl of the motors and the clanking of metal. "You're O.K."

By the end of an hour Peter was so thirsty that his throat felt sore. His hands trembled as he reached for the bottle of water, and his knees shook. He watched the men who were spelling Patchok and Davies, and himself. They'd been working for some time with occasional stops, but now they swung back and forth as though they were just beginning. Peter wiped his soaking face with his sleeve.

He had a lot to learn but he knew he could do it.

By the end of summer, Peter was almost as good as John Davies or Patchok. When the first week in September came by, Peter, in spite of the heat, felt as chipper as a bird dog. One morning, walking down Huckleberry, he looked over the hot countryside and wondered what it would be like at the Hilton Football Camp. The air would be crisp in the Adirondacks and the water cold and refreshing. Peter put the idea out of his mind. From now on it looked as though football camps were out of his line for good. Going to college at all would take every cent of money he had earned at the mill. Mr. Richardson was not yet able to work and Pete knew that he couldn't count on any more help from the family.

Peter went to the mill with his shoulders thrown back. Soon there would be a storm; the hot, heavy days couldn't last forever. If the heat wave ended the bar mill would be bearable again.

But that day was unlike any other in the mill. Abe Davies had had orders to speed up production. The men were working harder than they had ever worked before. It was the end of a long, hot summer and nerves were raw.

Once when they went to change places with Tony Pareto and two other men, Peter bumped into Tony. "Keep your big feet to yourself!" Tony shouted. "D'you need more room than anyone else in the shop?"

Peter would have answered but Patchok and John pulled him away. "It is the hotness," Paul Patchok said.

"Don't get in a scrap with anyone," John Davies told him. "This is the kind of day that brings trouble. Father's been uneasy for a week. Tony's a troublemaker any time, and so are his whole family."

By two o'clock Peter knew that old man Davies hadn't been worried for nothing. The men were in a fever from work, heat, and nervous exhaustion. Best friends were snapping at each other. Men who had worked together for years stood at either side of a mill and heaved and shoved at the steel without speaking to each other. If the day passed without a real fight, Peter decided, they were all in luck.

It happened at exactly a quarter of three, as the men on the next shift were arriving. Peter was catching for John Davies. They were both exhausted and Peter was slower, heavier on his feet than usual. The mill stands were very close and Peter was quite near Tony Pareto. As Peter reached out for the steel his empty tongs hit smartly against Tony's leg.

Tony was furious! The second his steel was through the mill stand he rushed at Peter and hit him as hard as he could. Peter staggered and then moved forward, his hands raised. As he and Tony clinched he saw John Davies struggling with Cariskey and Baden, Tony's two helpers. It was a free-for-all! A fight with madmen battering each other between the mill stands.

"I come, Johnny!" Peter heard Paul Patchok's high voice and at the same instant saw him run to help John Davies. As Peter turned to look, Tony jerked himself free and dashed forward. He picked up the tongs Peter had dropped and rushed to the pony stand where a new length of steel was just coming through. He grabbed the red steel snake from under the nose of a surprised workman. In another instant he ran back toward Peter and the others with the end of the steel in his tongs.

As he came toward them his eyes shone like a madman's. He was angry enough to kill and the steel in his hands was deadly! Paul Patchok was first in his path to Peter. Tony lifted his steel whip in both hands——

In one searing second Peter saw the choice ahead of him. He could stand and the red steel would fall on Patchok. He could charge and be branded himself.

Peter charged! He flew forward in a hard, straight line. His arms closed just above Tony's knees as he connected in a perfect horizontal tackle. Peter and Tony crashed to the cement floor. For a second the world reeled and then Peter saw the steel sprawling in a red arabesque beyond them on the floor.

In another minute John and Paul held the steel in their tongs and moved it away.

Peter got to his feet. They were safe! Neither he nor Tony was burned by the steel. Tony had been all ready to strike when Peter had tackled him. His arm had been raised and by a miracle the steel had been thrown well beyond them.

Peter looked down at his feet and saw Tony. He lay quite still, white and not moving. His head must have crashed back against the floor! "Get him outside quick," Cariskey said. "He's got to have air."

John and Paul helped to carry Tony out of the mill. The fight had stopped as quickly, as unexpectedly, as it had begun. The men were looking at each other with long, frightened faces. It had begun as a fight but it had nearly ended as murder!

Peter charged!

Outside there was a wind blowing and it was cooler. The clouds to the west were a deep purple and near at hand the shaking maple leaves looked white. There was a storm coming, and coming soon. In a few more minutes the rain would fall.

"Get water," Baden said, his arm under Tony's head. "Get water quick."

Peter glanced at Tony's white face and ran. If he had saved Patchok only to kill Tony? If Tony should get a concussion, should die from the fall?

But by the time Peter came back with the water Tony was sitting propped up against the building. "Wh-wh-what happened?" he asked as the water cooled his face. Cariskey and Baden told him.

He looked at them like a man coming out of a spell. "You mean," he said and nodded toward Patchok, "you mean I took a swipe at him with *steel?*"

Patchok patted him on the shoulder with an awkward hand. "It was the hotness," he said, "the hotness and the speed-up, the beeg poosh. Anybody might go crazy. And this time I have Peter for bodyguard."

Tony Pareto looked at Patchok, Peter and the others, and for a moment said nothing. Then slowly, shakily, the words came. "And you guys'll work with me again? Trust me to shove steel in the same mill with you?"

Patchok was the first to speak. "Sure," he said and jerked a thumb at the lowering west. "From now on the heat wave she be over. A good storm clear up everything."

Peter looked at him and grinned. Patchok was wise as well as kind. With the heat gone there would be much less tension in the mill. With summer over the pressure of the speed-up would soon be relieved. Now that Pareto's storm had burst, his anger was gone, spent like the heat wave. From now on Tony would be their friend.

Baden and Cariskey took Tony home; Patchok and John Davies ran into the mill for shelter. "Coming, Peter?" John called but Peter shook his head.

"I'll make for home," he said. "Probably get there before the storm."

He was halfway up Huckleberry Hill before the first heavy drops splashed up the dust in the road. Peter began to run. He looked over his shoulder and saw the moving clouds of rain. He'd have to make some tracks!

He reached his family's house just as the storm broke. He saw his mother and father sitting on the porch waiting for him and he dove for shelter.

At the same second the rain began to rattle on the roof. The valley in back of Peter was lost behind a gray curtain of rain. The storm had broken!

Peter wiped his sweating face and let the cool, welcome air blow against him. "That ends one whale of a day," he said. "One terror."

"What happened?" his father and mother asked. Peter told them about the fight as fast as he could. They swamped him with questions. Was he hurt? Had anyone been hurt? Had Pareto shown signs of strain for some time? "That's always the way," Mr. Richardson said. "A speed-up breeds trouble. It never fails."

"Was anyone hurt?" Mrs. Richardson asked all over again.

"Not a soul," Peter said. "Pareto was knocked out for a minute but he's all right."

Peter's father looked at him and grinned. "You've done quite a day's work, son," he said. "And you topped it by running up Huckleberry Hill."

Peter stared at his father and for the first time an idea burst in the back of his head. He had run up Huckleberry and he was hardly winded at all. Maybe he hadn't been to camp, or taken the coach's exercises but, man alive, was he in training?

"Dad," he said, "d'you realize what's happened? I'm in training! Best training ever. The coach won't be able to say a word."

Mr. Richardson laughed. "From what you tell me of tackling Tony," he said, "it looks as though the coach might think you'd learned something in the bar mill."

Peter turned to his mother and began to whirl her around the room in a wild polka. "Learned something?" he sputtered. "Learned something? Why when I get back to Hilton they won't be able to hold me."

RUSH ORDER

THE yellow ice of the Hudson River lapped the wooden edges of the quay like cold fat. To starboard of the steel lighter *Helen F,* the frozen spray waved and crumbled in jagged peaks, while to port the shore ropes were stiff with the cold.

Lars Jansen pulled tight the last rope of the tarpaulin that covered the huge steel girder filling the barge, and looked out over the river. To the east, the whirling channel was still clear but the black water looked even colder than the ice.

Just at that moment Captain Perkins appeared around the big girder. "We're delivering right away," he snapped. "I called Kane at the building and he said he thought we were under way already."

Lars looked at the little man as he stamped around the deck of his barge. Had he gone haywire? It was no day to rush delivery with the river full of ice.

The Captain looked more like an energetic bullfrog than ever as he whisked around the steel to make sure that Lars had covered it properly. "I called the office and they went wild!" he said. "Said this load was more important than anything the Ohio Company had shipped for years. Said if they didn't have it on time the Taconic Building would go over her time contract and they'd hold me responsible."

"How d'you mean?"

"I mean if this load doesn't get delivered on time we're out! Dismissed! Fired!"

"But why?" Lars said. "Did they tell you?"

"No," the Captain roared, "and I wouldn't have stayed to listen if they had. The slab-sided landlubbers! We've not been late delivering steel in five years and we don't start now. They're so scared of losing five cents they go crazy."

Lars jerked in the painter and coiled the stiff rope on the dock. Racing to deliver steel was one thing. Racing for your job was another. Lars had to keep his job. His father was out of work, his brother was sick. Lars *had* to stay on the *Helen F!*

"Look at the hoisting engine," Captain Perkins ordered. "It was coughin' a while ago. I'm going to stir up Baines on the *Mirabel* to get us across."

Lars pulled his cap farther down over his ears and looked at the engine. The wind cut his face like a whip and made his eyes water. It was a cruel day to race for anyone. He looked across the river and wondered why there was this sudden hurry. Damn the office force! Couldn't they ever be reasonable? Why leave a delivery order till the last possible minute if the steel was so badly needed?

Lars poked at the engine with stiff fingers. His hands were clumsy at best and now in the cold they worked like belaying pins. Lars blew on one hand and put the other in his pocket as he tried to think what to do.

"What's the trouble? Engine busted?"

Lars jumped. The voice was so absolutely unexpected. "Why-er-yes. But who in thunder are you?"

"I'm assistant expediter from the office. My name's Hughes. Jack Hughes. I'm to see this load over."

Lars moved back. So this young-looking boy was one of the enemy come to spy on Perkins and himself. "What's the great rush?" Lars demanded. "Why do you guys go up in smoke about this load?"

Jack Hughes shook his head. "Don't ask me," he said. "The big moguls keep us just as much in the dark as they do you. My orders didn't come from the erection department but from the president himself. All he told me was to get this load across on time or else——"

Lars moved aside as Hughes came aboard. "Cap Perkins is over on the tug *Mirabel* getting us a tow. We'll be moving out any minute," he said and went back to his engine.

Hughes leaned down beside him. "I bet you've got a clogged exhaust," he said, "and maybe something's loose here in the feed line."

Lars looked at him surprised. This boy spoke as though he knew how to work something besides a typewriter.

"Where does the exhaust come out?" Hughes asked.

Lars pointed to the small, round hole on the side of the *Helen F.* Together they hung over the side and looked at the rough ice. Lars reached down and felt the hole. It was frozen solid. "There's a monkey wrench behind you," he told Hughes. Hughes took it and broke the ice and flicked out the loose pieces. He straightened up and gave a few sharp twists to a nut near the head of the engine. "Now try her," he said.

Lars tried and the engine coughed, choked, wheezed uncertainly and began to run! Suffocating smoke belched regularly out of the exhaust.

Just at that moment Captain Perkins came back on board. "*Mirabel's* all ready," he said. "We'll be pulling out in another minute." Then for the first time he realized that Hughes was on board. "Who are you?" he sputtered.

"My name's Hughes," the boy said. "Assistant expediter from the office."

Captain Perkins was more interested in the engine. He looked and saw that it was running perfectly. "She's a-humming," he said. "How'd you manage?"

Lars nodded at Jack Hughes. "He did it," he said shortly, and moved off.

Captain Perkins scurried toward the last painter that held the *Helen F* to shore. "Make yourself at home," he told Jack. "Even an office hand's welcome if he's useful."

In another minute the tug *Mirabel* began to pull them across the icy water. "Come in the cabin," Captain Perkins said. "It'd freeze a brass monkey out here."

They pushed open the door and went in. The air was heavy with the smell of pipe tobacco and soft coal. In one corner of the shabby little cabin stood a small stove and on it a pot of coffee steamed fragrantly.

Captain Perkins came in and hung up his cap on a low hook. He sat down on his favorite backless chair. "Now tell us what it's all about," he said. "What's the idea of the office threatening a man's job over this delivery?"

"It's more than a threat," John Hughes said. "They mean every word of it. They were furious when you didn't deliver this morning."

Lars and Captain Perkins stared at him. "Deliver this morning?" the Captain roared. "And why in thunder should I deliver without an order?"

"No order?" Jack's eyebrows lifted. "I thought Sykes saw to it himself."

"Never!" Captain Perkins hammered on the table. "Never in this world. I didn't hear about it until I happened to call the Taconic Building and Kane the foreman wanted to know where we were."

Jack shrugged his shoulders. "It's the most important piece of steel they've set in a dog's age. Getting this set today might make or break the company's time contract with the owners."

Lars handed them the coffee in thick, white cups and began to drink his own. It was strong and hot and black, and the smell of it even transcended the smell of soft coal and tobacco. It was hot going down and somehow it gave him courage. He drank his cupful and then refilled his own and the others. If they were racing for their jobs—

Perkins and he—they'd need every bit of extra courage they could get.

In a short while the tug guided them into the basin formed by two long piers. On either side, the water was frozen solid so that there was just one barge-length of open water. At a word from Captain Perkins, Lars and a man from the tug undid the ropes that held them apart.

"From now on it's on us," Captain Perkins said from between cold lips. "From here on we either sink or swim."

The tug's captain pushed against them and then held off as the *Helen's* bow scraped and thundered over the ice.

There was a moment of ripping and tearing. Lars was certain the bottom of the *Helen* must be nearly torn out as she crunched over the rough ice. In another minute she came to a standstill. The tug had brought her to the right position but there were six feet of packed ice between her starboard and the dock.

Captain Perkins signaled with a frantic arm. Immediately the captain of the *Mirabel* began to push into the *Helen's* portside. The ice at either end of the *Helen* was in thick, immovable hunks. As the tug shoved the *Helen* toward the dock she acted like a gigantic snowplow with the ice rising in great piles at her bow and stern.

As the tug pushed, the *Helen's* ends were pressed more and more tightly between the growing mounds of ice. The barge creaked. The ice crunched, broke, shifted and repacked. The ice and the tug were an immovable body and an irresistible force and the *Helen F* was an eggshell between them. Lars looked toward the dock. It was still five feet away! Five hopeless feet that meant the difference of three men's jobs.

Suddenly Jack grabbed his arm and pointed to the loading crane that stuck up in the stern of the barge like a duck's tail.

"How about that?" he said. "We could lift the biggest chunks as though they were steel!"

Lars looked at him. This office boy was no fool. "Tell the Cap," he said. "I'll start the crane."

Lars rushed to the stern of the barge to put the slings on the crane.

In a moment Jack joined him. "Perkins is for it," he said, "but watch your step."

For a second Lars hesitated and looked at the ice. He couldn't swim and if the blocks shifted and he was flung into the water he wouldn't have a chance. "You've got to try it," he told himself. "There isn't any choice."

He let himself down over the stern where the ice was heaviest. It was so solid that there was not the slightest give under his weight. He fastened the cable around one block of ice with aching fingers.

"Ready," he shouted toward the barge. "Ready!"

Captain Perkins began moving the crane immediately. For a moment Lars was afraid the load might slip but it worked perfectly. The ice stayed firm. Lars held his breath and in another instant the great block was rolling in the black water on the portside of the barge.

In a little while there was a real space of open water by the *Helen's* stern. Lars got back on board and he and Hughes leaned over the low sides and grappled with the rough, chill blocks. Lars saw, as they forced the cables around one yellowish chunk that one of Jack's leather gloves was slit and that a smear of blood thickened on the ice. Well, it wouldn't do this white-collar kid any harm to taste real work for once.

The system worked perfectly until they came to the raised bow of the barge. Here it was more difficult to make the crane reach and it was impossible to get at the ice from the deck. "I'm going overboard again," Lars said sliding down. "If we can get about four more of these icebergs out of the way we'll be all set."

He had hardly reached the ice before he felt it giving and separating under his feet. He lunged toward the barge and with one shove of his powerful arms pulled himself over the side.

"We can't do it that way," he gasped. "It's sliding!"

They tried to grapple the ice from the bow but it was no use. The few extra inches of wooden side made it impossible.

"I'm going to try to go over again," Lars said. "It's the only way." He started over the side but Jack was there before him.

"This is my try," he said and balanced himself.

Lars held his breath as he went forward. At any moment he expected to see the cakes separate and to see Jack rolled under. But no such thing happened. Jack was at least forty pounds lighter than Lars and the ice stayed firm.

Jack leaned over again reaching for another chunk of ice. Lars held his breath and Captain Perkins shouted warnings. He'd never make it. The ice he was grappling with was too heavy. It was the last big piece that blocked the *Helen's* way and it looked twice as big as Jack himself.

"He can't do it," Lars told himself. "He couldn't possibly. He's not heavy enough."

Suddenly Jack leaned way forward and then straightened quickly.

"Good kid," Captain Perkins shouted suddenly. "Good kid!"

Jack had forced the cable around the last big block!

In the next few minutes neither Lars nor Captain Perkins had time to think of anything but steel. They helped Jack on board and then forgot him. He waited until the tug pushed them in the remaining few feet and then jumped off on the dock. "Ten minutes to go," he called back to them. "Just ten minutes."

Lars began to work on the huge steel girder that covered the whole of the barge deck. The metal was so cold that his fingers stuck to the steel as he forced the slings around the center of the girder.

"Ready?" Captain Perkins shouted.

"Let 'er go!" Lars answered. In another instant the captain had started the hoist, and the boom of the crane creaked upward. Lars jumped off the barge onto the dock and ran beside the truck. The driver was not in his seat. Lars looked this way and that. Where could the driver be? What was he doing? If he didn't come soon the steel

The ice he was grappling with was too heavy

would be late after all! Lars ran a few steps down the dock but the driver was nowhere in sight. He would have to see the steel safely in place on the back of the truck.

Lars felt the sweat run down his back from the effort and the excitement. He was warm again and no longer nervous. They would be on time. His job was safe!

The great load of steel swung out over the dock and then settled heavily, majestically on the back of the waiting truck. "We've done it!" Lars shouted across to the Captain. "We've done it!"

He was rushing back to the barge when he saw Jack come out of the covered end of the dock.

"Come here!" Jack called. "Hurry!" Lars crossed to the covered end of the dock. There, lying on the floor was the truck driver. On the left side of his forehead was an ugly blue mark. As they came up his eyes fluttered open and shut again. "We'll take him to the cabin," Lars said. "It's the only warm place."

They carried him to the cabin as fast as they could. Captain Perkins looked him over carefully. "He'll be all right," he said as the man opened his eyes again. "It was a nasty crack somebody handed him but the man's coming out of it."

But Jack was nearly frantic. The man wouldn't be able to drive in the next few minutes. That much was plain. Jack hurried back to the dock with Lars behind him.

"That steel," he said. "I've got to get it to the building myself."

Lars stared at him. For the Captain and himself steel delivery was accomplished when the steel was on the truck. For Jack the delivery was only begun. For the first time Lars' heart went out to him. He'd shown all sorts of nerve and still his job was not safe! Lars ran toward the truck.

"Come on," he said. "Between us we'll do it."

In another instant Jack was on the driver's seat with Lars beside him. Lars held his breath as Jack turned on the ignition. Would there be any more obstacles in their path? But the motor turned over and they rolled steadily off the dock.

As they turned into the street Lars was afraid the great weight of the load would send the truck wheels crushing through the asphalt. The street was hollow with the subway below! If they lingered too long in a single spot one of their wheels might go through and they would be stuck. Once as they went around a corner there was an ominous crack and a slight shifting of the surface. Jack took his luck in his hands and raced the truck forward. They made it! In another minute they saw the columns of the Elevated ahead of them.

"If we can get through there," Jack said, "we'll be safe."

Midway under the trestle Jack stopped the truck and he and Lars jumped out. He stared at the truck with its rigid load. His eyes narrowed as though he were using a sliding scale. "Get in," he told Lars, "I think I can make it."

They got in and Jack put her in gear. He swung on the wheel and began to turn slowly, slowly.

"Hold the wheel," he panted once. "I've got to be sure." He swung out from the truck, staring at the steel pillars that blocked his way. "Now," he said. "All together!"

They turned with all their combined strength. Each second Lars expected to hear the crack of steel on steel as the load crashed into the pillars. His wide shoulders hunched in anticipation as he pulled and shoved. Then slowly, gradually, the load straightened out. They were through!

"Just!" Jack said as they rolled forward. "By inches!"

When they reached the Taconic Building, Kane, the foreman jumped on the truck.

"How'd you make it across the river?" he said. "And why in blazes are you driving?"

They moved into the foreman's shack as the derrick hands took over the steel girder and there they told him.

"Well, I'll be shot," he said when they had finished. "The Atlantic Company's behind all this. They're our only serious competitor and when it looked as though we were going to finish this building on time they were wild. They've done a lot of crooked things in their day but this is the first time they've ever bribed someone in our office force."

"Who did they buy out?" Jack demanded.

"Sykes," Kane said. "We might never have discovered it if Captain Perkins hadn't telephoned me at lunchtime and I found out that he'd never gotten any orders to deliver. Then when I called the office force they sent you over and in a little while they got Sykes to blab on the whole thing."

"So that's it!" Jack turned to Lars. "You see, this morning he said he'd see to the rush order himself and so, of course, it was never given."

"But the truck driver?" Lars asked. "What happened to him?"

"Atlantic Company too. They've got some strikebreakers that'd do anything. They probably knocked him out and didn't have time to do anything to the truck before you came in."

"Well that's that!" Jack said. "But what we want to know is do we and Captain Perkins keep our jobs?"

"Keep 'em?" Kane said, and for the first time Lars saw him smile. "Keep 'em? If I have any pull with the powers you keep them with a raise!"

Once the boys were back on the street Lars looked at Jack and laughed.

"Well you never can tell," he said. "When you came around this afternoon I could have murdered you because I thought the rush was on you office chaps because you didn't tell us on time."

Jack nodded. "Same here," he said. "At least I thought you were willfully slowing up delivery."

They left each other at the subway and shook hands. "Indoor crew and outdoor crew," Jack said, grinning up at Lars. "As a team we're unbeatable."

STEEL JUGGLERS

The Derrick Crew

THE man on the derrick crew is in the vanguard of all steel building. He is the pioneer on the steel beams; the first man to raise the tall columns from the earth. Behind him come the riveters, the masons, the electricians, and the carpenters. Their work is hard and dangerous but it is only possible because the derrick crew has led the way.

As the steel skeleton of the skyscraper grows, gaunt fingers arise from the top of the building. These are the mast and boom of the erection derrick. On a large building you may see as many as five derricks pointing starkly skyward at the same moment.

The Egyptians knew how to use a derrick but their derricks were lightly made of wood. A derrick of strong steel lattice enclosing a tough wire cable is a recent invention. The idea is old but its perfection is part of the history of our own time. Only in the last thirty years have men learned to juggle ton weights of steel through space.

Even now, there must be endless plotting and planning before the first girder can be lifted from the delivery truck. Can a given derrick carry the load expected of it? If a derrick is set up at the northeast corner of the Phoenix Building will it collide with the derrick at the northwest corner? On the other hand will the two derricks on the south side be close enough to fill out all the beams and columns that must go between them?

Above all, are the men on the derrick crew so skillful that the hundreds of people passing in the street can walk beneath them in safety?

To solve these riddles the architects, contractors, subcontractors, and engineers meet for months before building is to begin. Plan after plan is drawn up, checked, and re-checked. Every piece of steel is accounted for, its weight and load considered, and its position decided upon.

The pusher, or sub-foreman in charge of the derrick crew, is called in to look at the plans and add his practical experience to the scientific theory. Every possible hazard is provided for, every precaution taken. Still derrick work remains the riskiest job on earth!

There are usually eight men on a derrick crew. Of these, the hoist engineer works at the base of the building, perhaps twenty floors below the others. No mole could be blinder than the engineer as he races and slows down his electric hoist. Surrounded by the din of riveting, the ring of hammers, and the shouts of workmen, the engineer listens intently for the sound of two little bells of different tone. If the bell at his right rings once—lift the boom. Another ring—stop! If the other bell rings twice—lower the load line. One ring—stop!

All day long the engine moves the derrick boom upward and downward. Time after time a red girder swings within inches of a workman's head. But the engineer never sees how close he is to an accident. He can only answer the janglings of a bell, knowing that the lives of people whom he cannot see depend on his promptness.

The bellman stands at the top of the building looking down at the street. In either hand he holds the ropes that ring the engineer's signal bells. It is a dizzy sight looking down from the edge of a tall, unfinished building to the narrow streets far, far below. A brave man might be excused for an attack of nerves, but the bellman acts quite unconcerned as he leans out over the chasm. Among steelworkers his job is considered easy and is often given to a man whom an accident has kept from heavier work!

Whatever his past history the bellman must be quick, alert, and thoroughly experienced in steel erection. He is the signal corps by means of which orders from the front ranks are sent to the engineering base.

Across from the bellman stands the bullstick man. He works at the base of the derrick which is mounted on a temporary wooden platform. He holds a thick, rudderlike pole in both his strong hands. It is his job to turn the derrick on its turnstile by means of this pole which he calls a bullstick.

Near at hand, balanced casually on the naked beams or standing on the rough temporary flooring, are the hooker-on and the tagline man. They are the rank and file, the backbone of the derrick crew. As the steel is lifted up from the street by the derrick they unhook it and place each piece near its proper place. Every piece of steel has a number painted on it which exactly corresponds with a number on the gang foreman's blueprint plan. It will be erected into its final position according to this blueprint.

The work of the hooker-on, as you can see from his name, is to fasten and unfasten the steel to the load line of the derrick. When he is not actually busy hooking the steel to the load line he helps the bullstick man turn the derrick.

The tagline man also gets his name from his job. His work is to help with the sorting and erection of the steel by means of a short rope called a tagline. He fastens the tagline at one end of a girder. Then as the derrick lifts the girder the tagline man is able to help ease it into place between two upright columns. It is hard work to guide a ten-ton load of steel through space, but if he has strong rope and an even stronger back the tagline man can do it.

In the forefront of derrick work are the two connectors. They need the toughest muscles and steadiest nerves of anyone on the crew. When the erecting begins, they must climb up the columns like monkeys up a pole. The least slip, the first false step, would mean death. Still they scramble up as though they were in an apple orchard, with legs and feet twined among familiar branches.

The man in charge of the derrick crew is the pusher. He is a sub-foreman whose word is law. He directs how and when the work shall be done and at the same time helps out wherever he is needed. If the tagline man cannot manage a piece of steel, the pusher helps him; if the bullstick is particularly stiff in turning, the pusher and the bullstick man shove together.

When the pusher is ready to erect a certain beam between two columns, he calls to the connectors. They climb up the red columns and lean forward to clutch the beam. Instantly the rest of the derrick crew unite to help. The bellman jerks at his rope as the pusher shouts, swears, and pleads his orders. The bullstick man shoves at his pole with the hooker-on straining beside him. The tagline man swings on his rope like a bellringer gone crazy. The connectors wrestle with the steel until their backs are wet with sweat. Their faces are tense as they struggle, for they know their work cannot be done entirely by force.

Even when the derrick is handling thousands upon thousands of pounds of steel, it must be made to work with absolute precision. The girder cannot be forced into the column slot—it must slide in. The entire derrick crew must work together to get the girder into position. When it is at just the right angle, it will fit perfectly and the connectors straddling the steel will be able to align the rivet holes with a drift pin. This is a long cigar-shaped wedge that the connector drives in with a sledge hammer.

When the steel is aligned, the connector will use the ballast with which he filled his pockets before climbing aloft. "Ballast" is the connector's nickname for the heavy bolts with which he will temporarily fasten the girder to the column.

The girders and columns will be surveyed by the plumbers-up to make sure they are absolutely true before the temporary bolts are removed and the steel permanently fastened by the riveters. In the meantime, although they have done their climbing, the connectors cannot be idle. They still have to go down into the street and help unload the next shipment of steel from the delivery truck.

Unloading steel is part of the connectors' job. They always unload a whole shipment at a time so that they will not have to keep coming down from the top of the building. They begin by fastening a sling made of steel cable around the girder that is to be lifted. Next they hook the sling onto the load line of the derrick. In the old days chains were used for slings instead of steel cables. The chains slipped off more easily and accidents happened much more often. Cables are a safeguard, but the beam can still drop if the connectors fail to fasten the sling exactly in the center of the load.

When the connectors are ready to have the derrick lift, they shout to the bellman or signal with a raised or lowered arm, or with a circular, stirring motion of the hand. While the steel is going up, they guide it with a long rope or tagline fastened at one end. It is their job to keep the steel from breaking windows, damaging concrete or crippling workmen on its way up.

As the derrick boom rises, the load casts a dark, threatening shadow on the street. Anywhere from one to fifty tons of fabricated metal are being balanced over the heads of passersby. The least mistake in the colossal routine would send the steel thundering down. A worn cable, a carelessly fastened sling, a confused bell signal—such are the instruments of fate.

Safety is only one consideration for the derrick crew. Erection often takes place in a crowded business district, and speed is essential. At 9:05 the steel for the 23rd and 24th floors is scheduled to arrive. The connectors are down on the street to meet it. The minute the truck stops, they jump on board and hurry to raise the steel. When a whole shipment has been sent up, the connectors follow it to the top of the building.

After the connectors have come up from the street, they will help the hooker-on and the tagline man sort the steel. Each piece of steel has its own place. In a short while every column will be stood on end and temporarily bolted to the column just below. When they are erected, the columns reach up two stories. They look like a forest of tall, branchless trees.

After the columns, the connectors set in the crossbeams that will hold the floors. As soon as the crossbeams are in place they begin again on the next lot of columns.

After two floors of steel have been erected and bolted, the derrick must be moved up to the new top of the building. This is done by re-rigging. Up to now the derrick has been using the boom to raise loads; now the boom is made to lift the derrick itself to a new level. During the process the derrick looks a little like a snake getting out of its own skin. It is an awkward job but a skillful crew can do it in a few hours.

The derrick crew, while at work, must be as well knit and as flexible as a crack football team executing a forward pass. Each man must understand the other's signals, and rely on his least gesture. Action must be fast and certain. The pusher cannot merely hope that the bellman will pass on his order to the hoist engineer or that the tagline man will swing his weight to the left. He must know that they will do it, and instantly! One moment of indecision is enough for a swinging girder to knock a man into space.

UNITED WE STAND

THE morning was gray and heavy with sleep when someone pounded heavily on Ed Tracy's door. Ed burrowed deeper into his pillow to escape.

"Get up, Ed!" His mother's voice grated on Ed's ears. "Get up or you'll be losing this job, too."

Ed snorted and settled down to sleep again. Lose the job! Hadn't he always left of his own accord? Lose the job. Was there a derrick crew in the world he couldn't work on as connector if he wanted to? Even Cleary, the steel foreman, knew he was good. Lose—the—job—Ed was asleep again.

Across the city the Larson brothers spoke of Cleary as they cooked and ate their breakfast. "It is one bad yob to be pusher under such a foreman," Sig Larson said. "Always he is in a hurry. Always fighting with the crews. If we were union he would not act so. Ed Tracy was wrong to argue us out of joining."

Olaf Larson ate largely of his oatmeal and said nothing. What was the use of talking? Tracy had persuaded them not to join the union and so it was settled.

In another half hour Ed Tracy was up. The Larson brothers and all the other men on the derrick crew were going toward the building from their separate parts of the city.

Cronin, the tagline man and Baits, the hooker-on, arrived at work at exactly the same moment. Cronin put away his clothes slowly, confidently. He was on time, never ahead, never behind. But Baits was breathless. He couldn't be late. Not even one minute, lest it imperil his job. Baits thought of his children, and of his wife in Bellevue Hospital. What would happen to them if he lost this job? He tried to turn away from the thought, so cold, so comfortless.

"You're late," Cleary, the foreman, said and Baits trembled. Even when a moment or two later Cleary was contradicted by the eight o'clock whistle Baits had nothing to say. He looked at Cleary miserably. So much depended on this man. So terribly much.

But Cleary had bigger fish to fry than Baits. He stood waiting at the entrance hall until Ed Tracy came in. Tracy knew Hodges of the erection department, did he? He had pull, had he? Well, Cleary would teach him and the rest of his impudent crew a thing or two.

A minute later Ed Tracy sauntered in, his hat at the back of his head.

"What's the big idea?" Cleary barked. "D'you think you own this place? Why don't you just come down for the afternoon?"

Ed pulled a neatly folded blueprint out of his pocket. "O.K. chief," he said. "I met Hodges and he asked me to wait until I could take this to Larson."

Cleary snapped the paper out of Ed's hand and then reluctantly gave it back. Ed grinned and swaggered over to the coat chest. He knew exactly what Cleary had had in mind. He'd been longing to call Ed down for being late and Ed had fooled him by stopping to get the day's work plan from Hodges. "This way to the brains, Sonny Boy," Ed congratulated himself. The other men were all wet about joining a union. All they needed was a chap like himself who could use his head. He'd get them, or himself, out of trouble fast enough.

Ed went up to the top of the building. When he was up the last ladder he sniffed the air like a wild horse. There was a breeze on top today. No walls, no ceiling, nothing to stop the good flow of air.

Ed looked around the erecting floor. In the center of the building was Fagan, the big Irishman who handled the derrick. On the edge of the building, his signal ropes in hand, stood Pat Dugan the bellman. Between Pat and old Buchanan, the hoist engineer who obeyed Pat's signals, there was an ancient feud. Buchanan was an Ulsterman and Dugan came from Cork and they couldn't stand one another. Ed Tracy shrugged his shoulders as he looked away at the tall red columns of steel they had erected yesterday. The crew was nothing but a bunch of dumb Swedes and Paddys but the job had its moments.

"Olaf, you and Tracy go down after the load. Fagan, is the derrick ready? Dugan, all set?" Sig Larson, the pusher, looked at his blueprint and gave his orders.

The other connector with whom Ed worked was Olaf

Larson, Sig's brother. Olaf was the original Silent Swede, Ed decided. So dumb, it hurt. Ed snapped the cable sling around a girder. Well, he'd stick to this job for a while and then when he got fed up he'd move along. Mill hand, riveter, derrick hand—there was nothing Ed hadn't tried.

The work went on smoothly until the middle of the morning. The first shipment of steel was unloaded by then and the connectors were on the top of the building again. Then Cleary came along to look at the job and as usual made a scene.

"You guys are late," he bellowed.

"We erect as fast as is possible," Larson said with his stiff accent.

"Don't talk back," Cleary said. "This load of steel wouldn't take a decent crew an hour."

Ed saw Pat Dugan take a step forward, his bell ropes in either hand, and then moved back at a gesture from Larson. The Irish were always spoiling for a fight, Ed decided.

"Your men are always slow," Cleary went on. "Slow and late." He walked off but there was a difference in the men he left behind. Fagan and Pat Dugan were angry. Baits looked white and his hands shook as he worked with the hook at the end of the cable.

Even Cronin was irritated into jerking quickly at the tagline on the next girder as they tried to set it into place. "Go slow," Larson told him. "Go easy. You cannot force steel. You can yust ease it along."

At lunchtime the crew sat around on the temporary wooden planking to eat. Ed Tracy took his lunchpail downstairs to the street. He wanted to get away from the others. What was the point sitting around chinning with those dopes? They'd probably start talking union again.

Ed ate and walked around the streets for a few moments, then knew it was time to go back. He met Cleary in front of the foreman's shack.

"Those two loads of steel for the pool on the twenty-first floor are coming over this afternoon," Cleary said.

Ed looked at him appraisingly. "So what?"

"They've both got to be in today," Cleary said. "Both loads."

Erect those two loads with the big cross truss that would be needed for the swimming pool in one afternoon? It couldn't be done. The days were short and it would be dark by five. "Can't be done," he said. "Not a chance."

For once Cleary did not bluster and roar. There was actually a smile on his face. "You tell Larson," he said. "Both loads get erected today or you're fired, the whole crowd of you."

Ed went back to work and said nothing. No steel foreman had the right to jeopardize the lives of his men by asking a derrick crew to erect steel faster than they could with safety. Accidents always happened when the men were in a hurry. The same thing was true in a mill, or in riveting, or at a blast furnace. Everybody could tell you the same thing. Ed would be shot if he'd give Larson a fool order like that.

But at three-thirty Cleary came up on top again. "How're you coming on those loads?" he asked Larson.

"Good," Larson said. "Very good. By tomorrow night they should be in."

"Tomorrow night?" Cleary's voice topped the rivet hammers and the wail of the wind. "Tomorrow night? Didn't I send you word by Tracy that they went up today or you were all out?"

Larson looked at Ed and Ed looked away. "I didn't tell him," he said. "No foreman's got the right——"

"Not got the right, eh?" Cleary shouted. "I'll show you who's got the right. You erect those loads by tonight or you're all fired!"

Cleary turned on his heel and walked heavily away over the creaking boards. For a second the men said nothing and then when he was gone they all spoke at once. "For the love of heaven what was the idea? Why didn't you tell us?"

Ed turned to face them. "He can't make us risk our lives," he said. "He hasn't the right. We can—we can—protest!"

"Protest!" said Cronin. "Lot of good a protest'll do you in the breadline."

Pat Dugan shook his long Irish face at Ed. "Look here, me young spalpeen," he said. "You've no dependents. Neither wife nor children. Why must you butt in? It was you kept us out of the union too."

Fagan, the bullstick man, took long, measured strides toward Ed. "If you make me tell the wife I'm fired," he said. "If you——"

Larson interrupted him. "It is useless now to talk, isn't it, Olaf? We could no more set that steel in an hour than fly. And in another hour it will be dark." Olaf looked at him and as usual grunted, "Yes."

Only Baits had not spoken. Suddenly he burst out, his voice breaking like an angry child's. "Listen," he said. "Why talk about risking our lives? We can't have our lives without food, can we? We can't live without the job that gives us food."

For the first time Ed realized what he had done. For the first time in all his life the cocky aggressiveness fell from him like an old coat. He had kept these men out of the union by his reasoning and now when the union might have helped them he had let them down. Ed looked at them, their faces tense and waiting, and he was afraid. He had to do something. Had to make it up to them somehow. They couldn't be fired! He saw that now.

Larson stood in front of him. "Tracy was a fool," he told the others. "But it makes little difference. Cleary wanted to get us fired and he would have. We could not erect in the dark and even if we had heard at lunchtime we would not have had time. Men are not cats to see at night."

Olaf nodded his head and the other men muttered agreements. Suddenly Ed had an idea. They could work at night if they had light enough! And he knew where he could get the light. Even now he could see the brilliant flame of electric welding going on beneath them and hear the sputtering of the hot steel.

"Listen," he said, suddenly breathless, "I've got an idea.

We'll set the steel and show up Cleary at the same time."

"Oh yeah?" said Fagan sourly. "Sounds easy."

"Not easy!" Ed said. "Hard, terribly hard, but possible. We'll set as long as we can by daylight and then when it gets dark we'll use welding equipment for a light. That gives enough light to set six loads!"

For a minute Sig Larson looked at him and stroked his big head.

"It is risky," he said. "Very risky."

"But so's setting steel in a hurry risky," Ed said. "It's more than that. It's suicide and you know it. This way when the big shots hear we've been working at night they'll know Cleary's been rushing us too much. It'll be newspaper stuff I tell you. Giant girder set at night. Men defy irresponsible foreman. There'll be so much publicity they wouldn't dare keep Cleary!"

Fagan and Cronin were the first to come around. "There's something in the idea," Fagan said. "It might work at that."

Pat Dugan looked at Sig Larson. "It's worth a try."

Baits came nearer to Larson. "We've got to try it," he pleaded. "We've got to. It's our one chance."

Larson looked at Olaf and Olaf nodded. "You beat it down to the engine and tell George," Larson said. "We erect tonight if it's the last thing we do."

Ed and Olaf raced down the stairs, Olaf going straight to the truck and Ed heading for the cellar and George Buchanan. "I'm with you," Buchanan said when he heard the plan. "I work all day without seeing the steel anyway."

In a minute Ed had left the hoisting engine with its racing motor and commanding bells and was on the truck with Olaf. In the first truck were large columns and girders. They went at them like men possessed. They snapped the cable sling around the exact center of the largest column. Ed waved to Dugan far above him, his long face blurry in the distance. The derrick boom lowered and Ed and Olaf hooked the load to the derrick cable. Ed waved to Dugan and the load lifted again.

They worked feverishly until the load was raised. Ed looked for the next load but it had not yet appeared, so that he and Olaf went on top of the building again. The other men were working like a fighting machine. Big drops of sweat fell from Fagan's face as he shoved at the bullstick and shouted to the others with brassy lungs. Baits hung on the tagline like a crazy tail to a kite and Sig Larson was everywhere at once.

The moment the boys came up on the roof Larson called to them.

"Here," he said. "Push!" Without a word they were beside him shoving at the bullstick. One, two, three, all together. Ed felt rather than heard the words. The men worked together as though they were one man.

Now Larson's big arm signaled Dugan who passed on the command to George and the engine. The great unwieldy column lay on the planking. Instantly Cronin, the hooker-on, unslung the column and hooked it so that it could be pulled upright for Olaf and Ed to set with bolts.

The column was heavy and awkward and they shoved at it side by side to get it in place.

"Easy now, PUSH," Larson ordered. At the same moment Ed felt Larson's great muscles spread and strain beside his own. On the other side Cronin and Baits fought at the steel like a pair of terriers, and above them, hot and silent, worked Olaf Larson.

Finally the column clicked into place. The bolts to hold her were screwed tight. Ed tightened his belt and started to climb. As he went up one column Olaf went up another directly opposite him. Ed looked across and Olaf grinned. Ed grinned back, feeling suddenly friendly. He was all right, the Silent Swede. He knew what he was doing.

The crossbeam which was to be set between the columns swung between Ed and Olaf. It clicked tight at Ed's end. Olaf stood up on his end while the beam was still held by the derrick and before it was fastened to the column! One slip and he would plunge to death. Ed looked at Larson. His hand was ready to signal. Baits and Cronin held the tagline, Fagan leaned to move the derrick, and Dugan waited tensely for the signal. They were behind Olaf, every man jack of 'em. Because they were behind him he walked on the beam blindly, confidently. He could trust his teammates. Olaf thrust in some of the bolts that bulged out of his jeans and slid down the column like a monkey down a pole.

Ed followed him and they landed on the temporary planking, panting and waiting for the next column.

It was growing darker. In the distance the city lights winked up at them and they could no longer see the river except as a dull pewter streak. They were just starting another column when Cleary came on top for the last time. "Too bad you guys are so slow," he said. "It seems a shame you couldn't get the work done."

He left them, confident that in another ten minutes they would have to follow him down. They waited until all the rivet guns were still and the two other deserted derricks pointed skyward for the night. Then Larson looked at Ed.

"You get the electrode holder and a mask," he said. "We'll try your plan."

Ed ran across the steel beams like a rat over rafters. He knew exactly where the equipment was left. The power came from a separate generator so that it would not be turned off with the rest of the building's electricity. He fumbled in the growing darkness with the holder, the mask, the electrodes and the heavy gloves. If it didn't work? Oh Lord, if it didn't work! He thought of Baits' face and Dugan's and rushed back upstairs, the stuff under his arm. It had to work!

Ed stood beside Larson while he fastened the electrode and turned on the pressure. Larson held up the mask and touched the electrode to a steel column. Instantly there was a blaze of light and a shower of sparks. Ed and the others jumped back, hands over faces. Boy, would it work? Would it!

Larson took the electrode to the farthest corner of the building. "You work on that number 5768 column," he said, " and then we'll erect the truss."

The men worked, their shadows eerie in the blue-white light. It was very quiet. Strangely quiet without the noise of the riveters beneath them. There was only the hissing of the electrode and the rumble of the traffic in the distant streets. Over it all the regular shouting of Larson's orders.

When the column was up Olaf and Ed went down for the truss. There was no hoist so they hurried up through the dark building that echoed with their steps. For a moment a watchman at the door tried to stop them but he was an old steel worker and when he heard what they were up to, he let them pass.

In the street it was black except for the thin light of the street lamp half a block away. Ed looked at the deserted truck with its inert load of steel. Getting that truss up in the dark would be a job to test them all.

They got on the truck and waited for the derrick cable to reach down to them. It came slowly like the fishing line of some giant's rod. Ed looked at the truss and then back at the black, staring face of the building. If they got the truss up without smashing into anything they were in luck.

As they hooked the derrick load line on to the steel, the welding light at the top of the building flashed on and off again like an uncertain halo. Olaf and Ed stared up, and it went off, and on again. "It's a signal, ye geese," they heard Dugan call down to them. "One flash means hold, two lift."

"It works," Ed said. "Better than seeing a chap's arm waving." Olaf said nothing, busy on getting the sling in place. Ed worked beside him and for the first time felt that Olaf was silent but not stupid. His broad face was dripping wet but smiling like an excited child's.

The light flashed twice and they yelled back, "Ready!" Slowly, the cable tightened. In another second the load would lift. The smile faded from Olaf's face. Ed looked at the great load of steel and understood. In the dark they could not see the fifth story very well, nor the sixth, nor the seventh. None of the upper stories was clear. How could they guide the load unless they were near it?

The thought flashed through Ed's mind just as the load on the truck began to lessen. He would have to go with the steel!

He must ride up through the night on the red steel truss. There was no other choice.

He forced the guide ropes into Olaf's hand. "I'm riding the load," he said. "Now!"

"Don't," Olaf's hand gripped his arm. "In the dark you could be hurt, crushed."

Ed jerked free and jumped on the steel. Before Olaf could move or speak the taut cable had tightened and he was moving upward.

Ed shifted his feet to a firm stance and grabbed hold of the cable. He was lifted past the first floor, past the second. He looked down and Olaf's scared face faded away. He looked at the building that he was passing. Fourth floor, fifth floor. Would he never reach the top?

At the sixth floor the load swung toward the building.

Ed could feel his heart beat in his throat. If it hit the building hard and he was dislodged? If he tried to ward it off and was crushed between steel and stone? Ed held his breath. He shoved at the building, with one foot as though he were keeping a boat from running too hard into a dock. He shoved as hard as he could. Then slowly, majestically, the red steel swung away from the edge of the building!

Ed clung to the cable with both hands. The steel would sway back again. He had only begun his job. It did swing back but with less momentum, and the next time still less, and less.

Ed moved up past the ninth, tenth, the eleventh, floors. He would be all right if only the men on top could keep the load moving steadily. But if they misjudged it? If Fagan, or Dugan, or Larson, or George made the least mistake? Ed could feel the cold sweat run down his back. He gripped the cables, his head swimming.

Ed looked down at the light-spattered darkness below him. His head swam and his heart thumped heavily. He forced himself to look upward. There, peering over the edge of the building stood Dugan.

"Hold on, Buddy," Dugan yelled when he saw Ed's face. "Hold on!"

Ed could breathe again. He was nearly there. Nearly within reaching distance and the boys on the crew were there to receive him. They pulled him off the load with strong, eager arms.

"Good boy," Sig Larson said. "Good boy."

There, peering over the edge of the building, stood Dugan

"Nice work," Fagan and Cronin said as one. Baits said nothing.

Olaf came up panting. "Is Ed O.K.?" he asked. "Is he?"

"Yes," his brother said. "He's fine, ready to go on working."

Olaf wiped his face and looked at Ed. "Whew!" he said, and then again, "Whew!"

When Olaf had his breath they went to work again. The rest of the job went smoothly. The truss was big but they could set it perfectly by the arc light. Once it was up the side of the building it was no harder to set than any other piece of steel.

Ed rubbed his hands and plunged into work. Shoulder to shoulder with the rest of the crew he felt invincible. Between them they could do anything. Set steel day or night through thick and thin. He felt the others shove beside him and strained in time with them. They were a team! A good team!

At ten minutes past ten the last bolt was in place. "One good yob," Larson said as he looked around at his men. "One lovely yob."

Ed realized that he was painfully hungry as he followed the others down the stairs. But what did that matter? In another ten minutes they would eat and, in the meanwhile, the job was done.

Hodges of the erection department, Bassett, the expediter, and several others met them at the bottom of the building. Behind them stood George looking like a sleepy mole suddenly brought up from underground.

"What in the name of Pete is this?" Hodges demanded. "Bassett saw the light and called me. When we got here the watchman said you'd been erecting."

Larson and the others looked at Ed. It had been his plan, now let him explain it. Ed moved forward and told everything he knew. Cleary's unreasonable speed-up, his own delay of the message. Cleary's ultimatum and their decision to work at night.

"You mean to say that bird's been racing you people to get that big truss in place?" Hodges asked. The men nodded. "Well, I'll be shot," Hodges exploded. "That's the last time that ever happens in this building."

Ed and the others said nothing. "You come back at noon tomorrow," Hodges said. "Your jobs'll be waiting for you and some overtime cash and a decent steel foreman."

Exactly two minutes later the derrick crew walked arm in arm down the street to the nearest dog wagon.

"Some men!" Ed thought. "Some workers!"

"No more Cleary to ruin the yob," was in Larson's mind.

"What a story to tell the wife," was in Fagan's.

"A double order of pie in two minutes," Dugan promised himself.

"Safe!" Baits thought. "The wife's safe and the kids. All safe."

Only Olaf spoke aloud, his voice rusty and unaccustomed to polite speechmaking.

"That was one honey of a stunt," he said. "And Ed Tracy, here, he is one honey of a worker. He turned the trick."

"You bet!" the others chorused as they filed into the dog wagon. "Ed pulled it off." "He did it." "Yeah, Ed's the boy all right."

Only Ed said nothing as he followed them into the diner. So they weren't angry, his crew. Ed bit hungrily into his doughnut. "Listen," he said, when the others had stopped talking, "when do we join that union?"

PROGRESS PICTURES

"BUT what's going to become of the darkroom?" Janet Grayson asked pointing to the photographs that lined the walls of the small cellar room she and her brother had salvaged for a studio.

"You can take pictures just the same," Bill comforted. "And we can develop over the weekends."

"It won't be the same with you in the steel business," Janet said, and then wished she had kept still.

"I tell you what," Bill said. "You can come down to the job and take Progress Pictures."

For the first time Janet showed signs of interest. "What are Progress Pictures?" she demanded.

Bill explained that they were daily snapshots taken of a building under construction. "Shows how far the cement, and the steel work, and all the rest of it's gone," he finished. "And sometimes they're useful when people make bogus claims."

It had possibilities, Janet decided. The next day, armed with an old kodak, she started down for the Pierpont Towers where for the past week Bill had had a job as an assistant in the erection department.

She walked past the entrance of the building. Bill had warned her against coming onto the job itself.

"I can't have a lot of family monkeying around," he had said; then added quickly, "and besides it's not the proper way to take pictures of a building. You ought to be at least across the street to get a decent perspective." Janet knew he was right, so she studied the building directly opposite to see what floor offered the best possibilities of a roost.

Doctor Tenant, the Grayson family's dentist, was on the third floor, but Janet decided that was much too low. She looked up following the fire escape to the sixth floor where THE SALON DE PARIS announced in large gilt letters that it offered the last word in millinery creations.

Janet crossed the street and took the elevator to the sixth floor. At the entrance to THE SALON DE PARIS she was greeted by a large, perfumed French woman who looked dubiously at the camera. When Janet explained what she wanted, the woman shrugged broad shoulders.

"That building has cause us enough trouble with the noise of the rivet already. Now why must I let someone, how do you say, go prowling with the camera?"

Janet's smile was sudden and spontaneous. "I won't prowl," she said. "I'll just go out on your fire escape and shoot, that is, take some snaps. And I'll be most awfully grateful. You see, my brother's working on that building and I told him I'd get some pictures."

Madame was visibly weakening and in another few minutes she let Janet out on the windy fire escape with a hundred rapid injunctions to be careful.

Janet took one hasty look downward and then pointed her camera at the steel trapeze that was going up across the street. Already the gaunt, red arms of the derrick were hauling up the steel for the ninth floor and in a few more weeks the skeleton of the building would rise above anything else in town.

Janet looked admiringly at the straight lines of the building. Even if it did spoil their photography business, it was super-luck for Bill to get a job on the Pierpont Towers. None of the other three boys who had graduated from college at midwinter had landed jobs, and here was Bill with just the right thing until he began his graduate work in engineering in the fall.

Janet's hands were awkward with cold as she changed the diaphragm opening. She wanted to snap the picture in a hurry and stuff her hands back into her pockets, but she forced herself to be especially careful. She and Bill had made photography pay by getting pictures that were good enough to sell to their friends. They had trained themselves to take time and trouble over each exposure. Being careful was a bore, Janet decided, peering at the thin midwinter sun, but it did pay dividends.

She focused on a group of oil lanterns that, along with some other supplies, had been stored on the sixth floor for future use. When each lantern stood out clearly she moved the camera slightly and took a general view of the building. The camera was an old one that Bill had given her years ago, but Janet did her best with it. Some day when their pictures had made a lot of money she'd get a new one. Meanwhile there was no point in blaming equipment.

As she snapped another exposure the deafening racket of the riveting hammer pounded in Janet's ears. She took a picture of the catcher just as he reached out for a red-hot rivet. He was standing on a little platform made of loose boards lashed to the outside of the building. Janet held her breath and then took another picture and still another. By the time she had snapped the heater on his separate platform, and the man with the riveting hammer, and the bucker-up who worked opposite him, she had used up her roll of films.

Janet went back into the millinery shop. As she opened the windows a blast of cold air blew on the back of an undecided customer. Madame frowned and ushered Janet to the door. When Janet started to thank her, she said that it was quite all right but that it couldn't " 'appen" again. This coming in and out made too much of a coldness. Of a certainty her patrons would complain.

At lunchtime Janet met Bill at O'Hara's Lunch Wagon. "How wide did you have the diaphragm open?" Bill demanded when Janet told him about the pictures.

"About .16," Janet said, "with a twenty-fifth of a second exposure."

Bill shook his head. "Will you ever learn?" he said. "On a gray day like this you can open it way up. All the way to 6.3. You'd better try some more this afternoon."

"But I can't. At least not from the sixth floor. When I came in through the window the milliner was furious."

This time Bill was really irritated. "That's the stupidest thing I've ever heard of," he said. "If you're going to take

Progress Pictures, or any other kind of picture for that matter, you've got to be on good terms with the people on whose property you want to take them. Diplomacy's part of your job."

After lunch Janet went back to the building. She went out on the balcony outside of Doctor Tenant's office and concentrated on clear views. Because of the angle she knew the pictures wouldn't be ideal but at least the diaphragm would be at the right opening.

Janet glanced at the fire escape ladder, but it was very long and very steep. She looked down at the three-story drop to the street and decided against going up the outside route. Progress Pictures on a slight angle would have to do. Even if Bill and the other steel workers could go loping around ladders high above the street, it had no appeal for her.

Janet was closing up the camera when she saw a gray feather of smoke. Even as she watched, it grew and doubled. Behind it, beyond the barrels and coils and bundles on the sixth floor she could see a thin, twisting tongue of flame. As Janet stared, it dawned on her that the fire might have started with one of the lanterns.

For a second Janet didn't move. Had anyone sent in the alarm? In the distance she heard the approaching siren, the clamor of the bells. Then she jerked her camera open. Bill was safe in the erection department shack on the ground floor. Every second the flames were growing and changing. She must get the best pictures she could before the fire shifted to the other side of the building.

In another instant she was taking pictures as fast as she could

She took her first picture from where she stood. Even as she clicked the shutter she knew it was a shame to sacrifice such an opportunity to a bad angle.

Janet glanced at the steep rungs of the fire escape ladder. It was the chance of a lifetime. She couldn't miss it by being a sissy.

Carefully, one foot at a time, she made her way up to the sixth floor. The wind and the steepness of the ladder would have been terrifying if she had had time to be afraid. With the sharp smell of smoke in her nostrils she reached the balcony on the sixth floor. In another instant she was taking pictures as fast as she could.

The fire engines had come by the time she finished, and the fire itself had spread to the seventh floor. Every minute the flames were reaching further and further upward in dense masses of red and yellow. A board from a scaffolding fell like a burning comet toward the street. Janet hesitated for a moment staring across the street. If the firemen didn't get it under control soon, the whole building would be a furnace! For the first time Janet was fearful of Bill's safety. Suppose more of those burning planks fell? Suppose one of them hit the wooden roof of the erection department shack?

Janet knocked wildly on the window of THE SALON DE PARIS. Madame opened the window just enough to scold. Then for the first time she saw the raging torch of the building opposite. "But in the name of a name!" she gasped, opening the window wide.

"It's an emergency," Janet got out as she tore past.

Madame hardly noticed her in her efforts to get the rest of the establishment to *"Regardez, regardez!"*

By the time Janet got to the street, the ladders were up and the firemen were slowly getting the fire under control. While they fought to keep down the flames, the city police held back a crowd of passersby and workmen. Janet elbowed her way through to them like a small but persistent quarterback.

"Have you seen Bill Grayson?" she asked the first man in overalls she came to. The man shook his head.

"Wouldn't know him if I did," he said and looked back at the fire.

"Have you seen—" she asked again and this time struck a sunburned steel worker who nodded yes. "He went down the ladder just before me," he said. "At least it looked like him, but the way the smoke was blowing around, you couldn't tell nothin' for sure."

Janet wormed her way through the crowd. Bill was nowhere to be seen!

Janet was so frightened that she couldn't think. She must do something—anything. She pushed her way to the nearest policeman. "Let me across," she pleaded. "My brother's in the superintendent's shack."

The man shook his head. "They're getting everyone out from there," he said. "The flames are under control but there's the danger of falling scaffolding. This is as far as you go, young lady."

Janet started to duck out under his arm and run for the building, but just as that minute she saw a man from the erection department whom she knew. "Where's Bill?" she asked. "Where is he?"

The man looked grave. "They've taken him down to Vesey Street to the main office," he said.

"They've taken—" Janet repeated. "But was he hurt?"

"No," the man's voice was reassuring. "No one was hurt. It's just that he was experimenting with some of the electric welding equipment at the place the fire started. I guess he'll be able to explain it all right."

"What d'you mean? What do they think he's done? Who sent for him?" A dozen questions rushed to Janet's lips, but the man shook his head.

"It'll be all right," was all that she could get out of him. "Bill'll be home in a little while, and like as not everything'll be straightened out."

The fire was just about over and the crowd was dwindling. Janet had used up all her films. There was nothing for her to do but go home.

It was an hour before Bill got there. The minute she saw his face, Janet knew something was wrong. "Bill," she demanded, "what ever happened? Were you hurt?"

Bill shook his head. "Nobody hurt," he mumbled. "Just property damage."

"But what's the matter? What happened to you?"

"I've lost my job." Bill said it slowly and distinctly so that each syllable fell heavily on Janet's ear. He would have walked off but she held him by the elbow.

"Bill Grayson," she said. "Don't you dare go off like that. You come on down to the darkroom and tell me the whole thing. What are we partners for, if you can't spill things?"

Still with a wooden face, Bill told her the whole story. It was near the end of the working day and he had gotten one of the electric welders, a man named Peters, to let him try a little experimental welding. The man had gone downstairs for an extra mask and Bill had tried welding a line or two by himself. Then he had smelled smoke and run for the stairs. "I shouldn't have tried it without Peters, maybe," Bill finished, "but that was all there was to it. They sacked me for being implicated in the start of the fire. Said I was lucky they weren't bringing criminal action. The worst thing of all is that they sacked Peters too, and he was on his way to the ground floor."

Janet's brain began to whirl with a series of disjointed ideas. "Where were you when it started?" she sputtered. "What floor were you welding on?"

"Seventh," Bill said dismally. "I saw the flames come up from the sixth but by the time I got down, the fire was terrific on the seventh and nobody'd believe my welding didn't start it."

"But it didn't," Janet exploded. "I've got proof the fire started on the sixth floor right in my camera. I got it almost from the start."

With trembling fingers Bill helped her take out the roll of film. "Wh—what if they don't come out?" he asked. "What if you haven't got proof?"

"They're going to come out," Janet said. In her own mind she was much less certain, but she wasn't going to have Bill know that. "You get the developer ready," she said. "These are coming out all right."

Somehow they managed to get the negatives developed. "It's clear!" Bill said, as he pulled the first negative out of the chemical bath. "And so is this! And this, and this!"

"Oh, Bill! They're all right!" Janet was standing on her tiptoes to see. "Look, you can see that the fire started right by those supplies. And Bill—" Janet was dancing with excitement. "I think I know how it began. A red-hot rivet fell on one of those lamps and it exploded. The smoke was terrific, of course, and in another minute everything was hidden."

Janet looked carefully over the negatives. Finally she pointed to four. "These are the ones I took in the morning," she said. "You can see by these exactly how it happened. See, they're riveting here on the eighth floor and those lanterns are on the sixth floor, in a straight line below them. The second one of them was hit, the smoke and flames would hide the lantern itself. Nobody except the man who dropped the rivet would know where the fire started and maybe even he didn't know."

Bill looked at the negatives and then looked at Janet. "We print these just as fast as we can," he said, "and first thing tomorrow we go down to the boss."

The next morning when Janet was standing beside Bill in Mr. Pierpont's office, she felt less confident. It wasn't quite so easy to tell the story to this quiet, stern man whose eyes looked as though he were more accustomed to dealing with steel than people. She didn't feel comfortable until the pictures were spread out in a row across his flat top desk. Then she could breathe again. He'd have to understand. The pictures made it all so plain.

For a minute there was no sound in the room except a little swish of felt as Bill turned and turned his hat in nervous fingers. Finally Mr. Pierpont looked up and his face looked less hard and impersonal.

"You're right," he said. "There isn't a question of a doubt that the fire began right here as your picture shows. Your theory of a dropped rivet is perfectly sound. It might have hit the lamps and that would have explained the suddenness of the smoke and the type of fire. Grayson, I spoke hastily yesterday. You and Peters will report with the rest of the men on Monday."

When they finally left the office, Janet didn't know whether she was walking on air or a soft pile carpet. "Wasn't he wonderful?" she demanded. "Didn't he understand quickly?"

Bill nodded, but said nothing, as they started for home. Words seemed to have entirely escaped him until they got to Seaman's Photographic Supply Store, and as usual stopped to look in the window.

"See that?" he said, pointing to a camera which Janet knew was equipped with an expensive foreign lens. "My first pay check gets invested in that."

"For you to take to Engineering School?" Janet asked.

"For you," Bill said. "You and nobody else. Just in case you want to take some more Progress Pictures."

HERO IN OVERALLS

Riveting Gang

OH, YES, heroism is dead and courage was buried with the last crusader. You will hear that on all sides. Some people are always bewailing the passing of the good old days when men were men and heroes heroes. Those same people will go by an unfinished skyscraper without as much as looking at it. They may shrug an irritated shoulder at the racketing noise of the riveting hammer but they won't look at the riveter. Oh, no! If they did they would see a modern hero who could give points on courage to any knight in armor.

But the mourner for the good old days is usually too busy to look around him. Besides he probably wouldn't be interested in a man who fights but doesn't kill and who faces death without glory.

The riveter doesn't get to be a celebrity, but his courage is as worth following as that of any headline hero who ever lived. To begin with, he is a workman with the poise of an acrobat, the skill of a juggler, the strength of a blacksmith, and the teamwork of a ballplayer. On his having these qualities depend not only his job but his life, and the lives of the scores of people in the street below him. He goes about his work hundreds of feet above the city.

The derrick crew will erect the giant steel girders and put in the temporary bolts. The plumbers-up will see that those girders are properly aligned. But the riveter must see that the steel is permanently, irrevocably united.

Whether it is in the sub-sub-basement or on the highest pinnacle of a sixty-story building, his sole job is driving rivets. Heat, cold, high winds, slippery steel, and swaying boards are the hazards of his trade. Molten metal, flying sparks, shattering noise, and backbreaking vibration are its by-products. Danger is its very essence. Aviators, engineers, matadors, acrobats, seamen, all must take risks. Should they meet with misfortune, there is still some possibility of escape. Aviators with failing motors have before now glided safely to earth. Great trains have been wrecked without a fatality. Seamen have clung to boards and been rescued since the days when Magellan was nearly shipwrecked going around the Horn. But let the riveter take one false step on his giant steel trapeze and he is utterly, irretrievably lost.

A building foreman hires and fires his riveters in gangs. These gangs travel around together, from job to job, often following one particular foreman whom they know to be a good "pusher," or boss. Sometimes they hang together for years, developing a teamwork which would put the Yankees or the Giants to shame. Riveters are never judged as individuals, but by the number of rivets which the crew as a whole can drive in one day. If they are using steel rivets seven-eighths of an inch in diameter, it is a high average to drive four hundred in eight hours.

The gang, which is a closer corporation than the oldest Greek key fraternity, is limited to four members, the "heater," the "catcher," the "bucker-up," and the "gunman."

In most gangs, the heater is the leader. He is the Vulcan of the crew and works with a small movable forge. By turning a crank, he fans his coals to terrific heat. Sparks blow in all directions. Even his heavy clothes give little protection. He grabs a rivet from a nearby keg, and with a small pair of tongs stows it in the coals until it becomes cherry color. He must be skilled in his work or the rivet will become overheated and bits of metal melt off, ruining its shape.

He works at some distance from the other three men, sometimes on the newly laid concrete floor a story or two below them. At other times he is on the same level with them, on a tiny wooden platform thirty or forty feet away. When the rivet is at just the right heat he faces the catcher, who stands with the other two men, known as the bucker-up and the gunman, on a flimsy wooden scaffolding. This scaffolding, which is the crudest sort of platform made of old boards slung together with rope, usually hangs near a connection where a beam and column are joined together.

The catcher watches the hammerer (the gunman), and sees that he is ready for another rivet. He faces the heater. Sometimes he calls to him, but the teamwork of these two is such that this is seldom necessary. The catcher lifts up his cup, a small, battered tin pail with a handle on one side. Words are never wasted. The heater beats on the side of his forge when he is ready. That means "Are you all set?" The catcher leans forward.

The heater hurls the rivet through the air!

The catcher's eyes narrow. For a second his mouth is a hard narrow line. A red streak flies through space. There is a sharp, satisfactory thud. One more rivet has arrived at its destination!

Without even stopping to breathe a sigh of relief, the catcher takes the rivet out of his cup with a pair of tongs. He beats it against the nearest girder and the sparks spray out from under his hand. The catcher does this to knock off any scaly bits of steel which might become loose after the rivet has been driven, and cause it to turn in its hole. Next he sticks it into the hole that is cut through the steel plates which are to be secured. Because he sticks the rivet into its hole he is sometimes known as the "sticker."

The next worker is the bucker-up. He stands facing the gunman, on the other side of the connection to be riveted. His tool is a short, murderous-looking crowbar called a "dolly bar." With all his weight he presses against the capped, headed end of the rivet. This is to make sure that the soft metal properly fills up the hole, and also to give the gunman enough resistance. This takes muscle! He must resist the force of the gunman pressing upon the headless end of the rivet to such an extent that the rivet will not fall out of the hole, but will squash up into a head at its straight end.

The actual formation of the head at the straight end is the work of the gunman. He works with a pneumatic hammer, known to the trade as a "rivet gun." This is a steel tool more deadly than the smoothest Colt "45." At the end of the muzzle is a detachable, cup-shaped piece of steel called the "rivet set." This set is the part of the gun which actually hammers the rivet into shape. It is actuated by a piston inside the barrel of the gun. The piston pounds against the rivet set, driven with terrific force by compressed air, which is led up from a compression engine several floors below by means of steel and rubber hosing.

There is nothing to keep the rivet set attached to the barrel of the gun except a piece of wire. This wire is often a makeshift device put on by the riveter himself. The wire will keep the rivet set in place only if the air pressure is turned *off*. The pressure of the compressed air is enough to break the wire and send the set shooting out into space, and this is how a great many riveting accidents happen. A gunman will turn on his pressure when his gun is not directed at a rivet; the piston and rivet set will break the wire and fly out, possibly hitting the bucker-up, who stands opposite the gunman. Even if he is not injured by the rivet set the shock will be enough to throw him off his balance and he will fall hundreds of feet to the street. There was one case where a bucker-up was hit by an escaping rivet set. By an act of Providence he was not thrown off his perch, but he did lose the sight of one eye!

When the gunman is actually hammering, he places the rivet set over the straight end of the rivet, while the bucker-up leans against the capped end. The gunman pulls his trigger; there is a terrific noise, and the compressed air relentlessly moves the piston back and forth inside the gun.

This noise is bad enough for anyone in the neighborhood, but to the workers it is absolutely deafening! The power of the compressed air, generated from below, is such that everything near the gunman vibrates. His whole body is shaken as though he were made of straw. As for the rivet gun, it quivers and moves in his hand like a thing alive. The bucker-up, braced on his dolly bar at the other end of the rivet, shares his trouncing.

This is the most exhausting part of riveting. The workers' teeth are set on edge by the jar. Their arms tire from the constant pressure they must exert. Soon their ears ache from the unceasing noise. Their backs become leaden. Still they must keep on, until the straight end of the rivet has a head as perfect as the one against which the bucker-up presses. The actual time it takes a pneumatic hammer to beat a heated rivet into shape is fifty seconds. This seems short until you realize that it is fifty seconds of near-torture. Almost a minute of ear-splitting noise and terrific vibration, plus the constant heat of the red-hot steel. Remember, also, that this is repeated from two hundred to five hundred times within eight hours.

The teamwork of these men is miraculous. With scarcely a word a rivet is heated, thrown, caught, put in its hole, and firmly fastened. Incredible though it may seem, heater and catcher almost never miss a rivet. Just as well, when one thinks of the death-dealing possibilities of a red-hot piece of steel hurtling through space! The bucker-up and gunman are equally accurate. Every rivet is inspected to see if it is firmly secured. If it is badly driven, it is marked by the inspector to show that it must be cut out and done over. Even in rush jobs, however, this does not happen very often.

There have been many movies of people walking out over the street on a beam a foot wide. We see them make hair-raising escapes, we shudder and comfort ourselves by saying that "it's all faked, anyhow." This may or may not be true in the movies. In actual work, the dangers are emphatically real. A riveter's apprentice, who had not been in the game for three months, once gave a most spectacular exhibition of absolutely unconscious courage. Carrying over his shoulder a bag of rivets weighing at least fifty pounds, he walked from one end of a beam to the other and back without having a support to cling to and without once sitting down to get his balance. The total distance was about forty-five feet. His path was about eighteen inches wide and was thirty-three floors above the street. He didn't do it on a bet or dare. It was merely part of his everyday job of keeping the heater supplied with rivets.

The job of rivet boy, as the apprentice is called, is not calculated to encourage the timid. From morning till night he must bring up bags of rivets from the supply-store to the scene of operations. The supply may be kept twenty floors below the actual work, in which case he will ride in a temporary hoist part way and then climb a series of ladders to the top. When he arrives, he may have to walk the width of the building on a series of beams to reach the heater. If he carries the rivets up quickly, is sure-footed, and absolutely fearless, his turn will come. One day the catcher of one of the gangs won't show up. Since no gang is put to work without all four members, the rivet boy will go in as a substitute. If he makes good in his temporary position, he will soon become part of a regular gang.

About the highest position the aspiring riveter can hope to fill is the job of rivet boss. There is generally one boss on each big building, whose job is to go around from gang to gang to see that they are all doing good work. The advantages of his position are higher and more regular wages. He is paid by the week, whereas the gangs are only paid for the actual number of hours they put in. In rainy weather they cannot work, as the steel would be too slippery. If it rains for a week the rivet boss will get paid, but the actual workmen will not receive a single red cent.

But even on a calm sunny day, riveting is no Sunday School outing. The men work almost unceasingly and usually without speaking. Even in winter they are terrifically hot from the speed of their work and from the heavy clothes which they must wear to protect themselves from sparks. As they work their faces look lean and hard. Their jaws are set and the sweat stands out on their foreheads only to be blown away by the wind.

When they rest it is for a short half hour to eat their lunch which they have brought with them. Most of them eat their sandwiches on their own platform or up with the derrick crew. It's not worth going down thirty-five floors for a half hour!

If you see the riveters on the sidewalk after hours, they'll joke about the dangers of their work. They will tell you there is more danger in crossing streets through the New York traffic. If you ask what has become of a former member of their gang they grow sullen and say they don't know. They appear as gay and rollicking as a bunch of sailors on shore leave. They will try hard to convince you that it is all a merry lark. But watch them at their work, and there is a miraculous difference. The laughter is gone. The carefree bravado is gone, too. They become as hard, as intense, as the steel and fire with which they earn their bread.

SLIDE, SAILOR!

NO ONE was more surprised than Jim Aldrich to find that he was working on the Atlas Building for the Oakland Steel Company. Carrying rivets was queer work for a sailor, but this was no time to pick and choose. Jim thanked his stars and a friend of his father that he had the job. If he could only keep it a few months everything would be all right, for he had been promised a berth on a ship later on.

Jim's reception by the superintendent in his shack at the base of the building was hardly encouraging. "We don't think much of guys who get jobs on pull," the super growled. "But you might as well try. You'll tote rivets for Eagle's gang and for Beach. Remember, what they say goes."

All that morning Jim loaded kegs of rivets into the hoist, tugged them up temporary wooden stairs, and finally carried them up ladders to the twenty-second and twenty-third floors. High places were not new to him. These ladders were no more precarious than the shrouds of a ship but they were longer. Jim felt new and painful muscles that seemed to have recently sprung into being in his body. The ladders were a lot longer!

Jim looked down at the unfinished floors of the building. Not a pleasant place in which to trip and fall. At one side, he could see New York harbor glistening in the morning sunshine. Just above him he heard the infernal racket of the rivet gun of one of the gangs he was to supply with rivets. Jim made his way cautiously upward. It would take more than tired muscles and ringing ears to get him off this job.

Eagle's gang was at the top of the building. Jim stopped for a moment to watch them at work. The heater stood on a little platform with his forge in front of him. Jim put his pile of rivets down just as the man threw a red-hot rivet across to the catcher, who snagged it in a small bucket, picked it up with a pair of tongs, and placed it in the rivet hole. The bucker-up leaned against one end with a heavy dolly bar and the gunman let fly with his pneumatic hammer. The deafening clatter made the steel columns vibrate.

"Some noise!" the heater grinned as he poked his fire into a roar.

Jim nodded, and picking up his empty keg started down for another load. From the beginning he had liked Eagle's gang better than Beach's.

At noon Jim was sure his first impression had been right. He was sent down for a bucket of water and the men's lunch boxes. Both gangs ate together on the heater's platform on the twenty-second floor.

"Why are you carrying rivets?" Beach asked, biting into a sandwich.

"I need the cash," Jim said.

"Never done it before, eh?"

"No," said Jim. "Been to sea."

"Sailor boy! I might have guessed it. Takes the navy to send out a mug like yours."

Jim's face was almost as red as his hair but he said nothing. The four men on Eagle's gang were silent, too. Jim had a comfortable feeling that they didn't think much of hazing. Just then the catcher on Beach's gang got up. "My name's Welsh," he said. "What's yours?"

"Jim Aldrich."

"Well, I reckon you'd like to stay in this outfit?"

Jim nodded. He hoped none of them knew just how much he wanted to stay until his ship's berth was ready. He just had to keep this job until then!

Welsh tightened his belt. "Come on," he said, "and we'll see if you've got the makin's of a riveter."

Jim stood up and followed the man to the edge of the first ladder. "Go down to the base of the building and get us another keg of those light rivets," Welsh said. "When you come back it'll be time enough for your lunch."

Jim looked at him without speaking and started down. On a ship a man was either your superior and you took his orders, or your equal and you didn't. These men couldn't hire him or fire him, and yet they could boss him until he didn't know which foot to put before the other. Still if it wasn't anything more than an extra load of rivets they wanted, he was probably in luck.

On the way back Jim understood what they were up to. He rang for the hoist that usually took him up to the ladders. "Hoist boy's off for lunch," a cement worker told him. "If you want to get that load up you'll have to tote it."

Jim began to walk slowly up the stairs. Climbing twenty-three flights was no joke to him. Jim clenched his big fist. He wished he were on a ship in a fairly rough sea and that he and this chap Welsh were both off duty. He'd have holystoned the deck with Welsh's head.

When Jim finally arrived panting on top of the building, Beach, Welsh and the rest of their gang were rocking with laughter.

"Too bad, Sailor," Beach called. "You look winded."

Jim fought for breath to answer but before he could speak Welsh was beside him patting his back with mock solicitude. "Too bad, Sailor, you're all soft. Don't they give a chap any exercise at sea? It's too bad, Sailor. Softies don't last long in the steel game."

Jim gulped down his sandwiches and followed them to work. He was so mad that the bread stuck hard in his throat and the food was tasteless. The worst part of it was that they were right. Or at least that there was an element of rightness in what they said. Compared to the men on either of these crews, Jim was soft.

The first day was not the only time they plagued him. One evening after a hard day's work, Beach and Welsh made Jim unrig the riveters' scaffold for the night. Jim set to work taking the rope from Welsh. Automatically his seaman's hands coiled the rope over again into neat, orderly piles. "That's right, Sailor," Welsh said. "Show us all how it ought to be done. Teach the oldtimers how to do a good job." With that he gave the ropes a kick and Jim's handiwork was knocked into a hopeless tangle.

Jim said nothing but went home as soon as he could. There was nothing that he could do. If they wanted to ride him he couldn't stop them, not even by fighting. The day he had signed for the job the boss had told him that fighters on a building were fired.

One Monday morning Jim wondered how much longer he could stand it. The weather reports promised a drop in temperature followed by storms, but as yet conditions had not become bad enough to stop work. The gangs were paid on a time basis and Jim knew that they would work just as long as it was humanly possible.

He felt cold and apprehensive as he picked up his bucket. The weather was getting steadily worse. It was beginning to drizzle and the moisture was turning to ice on the steel beams.

The third time that Jim came up with the load of rivets, Eagle and his gang had stopped work. Two of the men, heads bowed against the gale, stood shivering behind the heater's forge. The other two, close to the edge of the steel structure, were struggling to bring in the gunman's scaffold. They knew that it must be taken down or be blown into the street.

Jim watched them as they fought against the increasing storm. The wind beat into their faces and tore at the rope in their fingers. Jim held his breath as they worked. They were veteran steel workers but to anyone trained on a sailing ship, their handling of the ropes seemed very clumsy. There was a sudden, stronger gust of wind. "Hold her to the leeward," Jim shouted but it was too late. The men blinded by the blast did not notice that one of the ropes that held the boards of the scaffold was slipping. The next instant the wood crashed down and they were left holding an empty length of rope.

The noise of the boards thudding onto the floor below reached them in spite of the roaring of the storm. At the same moment there was a shriek of pain, and then nothing but the beating of the gale.

"Beach's gang was working down there," Eagle gasped. "One of them must have been hit!"

As fast as the wind would let them they crept down the ladder to the next floor.

"Who's hurt?" Eagle shouted.

Welsh answered, trembling. "Look!"

Beach was sprawled on the edge of his wooden platform. One of the falling boards had struck him just as he was leaving. His arms dangled helplessly in the wind. Jim was certain that at any moment he would be blown over.

Jim watched Welch try to make his way across the steel girder that separated them from Beach. The wind was directly against him and the icy metal gave him no foothold. With his arms and legs wrapped around the beam he inched himself forward a little way but it was no use. He could make no headway against the wind.

"Beach is through," Eagle muttered. "We can never reach him against that gale."

Another man tried and yet another. The wind and the ice made their task impossible.

"If we could only work up into the wind," Jim thought. "If this were a ship and we could head her into it."

Suddenly a thought flashed into Jim's mind. Looking up, he saw the length of rope that had broken away from the fallen scaffold. It was being buffeted about in the wind.

Jim headed for the ladder without another word. Whether it took him seconds or minutes to climb up he never knew. He only knew that at any moment there might come a blast that would blow him over like a celluloid doll. Somehow he managed it and then he crawled across the heater's platform toward the dangling rope.

One end was firmly fastened around a beam. The other end would more than reach down to Beach. Jim looked over the edge and shuddered. Did he have the courage to risk it in this gale? He could see that the black shape which was Beach's body lay nearer the edge than before.

In another second Jim was sliding down the rope. The wind whirled him about like a kite. The icy rope cut into his hands. He dared not slide for fear of being blown off. Hand over hand he let himself down. He knew the chances were against him but for the first time in weeks he was handling ropes not rivets. He could have been doing this on ship in a storm.

Jim kept making his way slowly down, hand over hand. The pain in his palms and fingers was almost unbearable. Would he never get there?

Jim was sliding down the rope

"Good work, Sailor!" Eagle's powerful voice came as a whisper against the wind. The next moment Jim was on the platform beside Beach.

For a moment Jim could only feel that his hands were no longer around that torturing rope. Then he realized that his job was not yet over. Beach's limp body was perilously close to the edge. There was not a second to lose.

Jim tugged desperately until he had Beach where he wanted him with his arms and legs balancing him across the girder that led to the other men. For the first time the wind was a help rather than an obstacle. It was blowing directly at his back and helped him in shoving Beach's body along the girder. If only the gale didn't shift they would be all right!

Every man watched as Jim made his way forward.

"Nice work, Sailor!" somebody shouted. Then many hands pulled Beach and Jim to safety!

A half hour later they were in the superintendent's shack while the wind whistled outside. Beach was conscious again. The board had knocked him out and his wrist was sprained but that was all. He lay back on some burlap bags and listened to first one man and then another tell the story of his rescue.

"Boy," he said when they were finished. "That took nerve!" He looked at the superintendent and grinned. "You're not thinking of firing this kid are you, boss?"

The boss considered the question gravely. "No," he said. "I reckon a rope-sliding sailor's just what this building needs."

BLINDING LIGHT

Electric Arc Welding

THERE is a new blaze of light in the sky. Along the steel framework of buildings under construction you can see brilliant fireworks where the electric welder is joining steel to steel.

The welder works surrounded by the bright halo of his mysterious tool. In order to use it he must wear a mask in which are set heavy, dark glasses. He must wear these every moment that he is at work to protect his eyes from the terrific glare. Riveters, derrick crew men, cement mixers, bricklayers, erection foremen, have learned to look the other way when the welder is at work. Even a few moments of that quivering blue light would give them sore eyes, should they stop to watch.

It may seem strange that the riveter and his new rival, the welder, should be working side by side on the same building, but this often happens. Engineers agree that welding will not replace riveting but will be used along with it. The electric welder will be hired for repair work, for work on hospitals where quiet is important, and wherever light, quick work is essential.

If you have seen the welder behind his blinding shield of light, you will want to know what sort of man this is who works on that small wooden scaffold hundreds of feet above you. If you've ever had a lamp short-circuit with searing flame, you'll be curious about this man whose daily job is with short circuits.

Tom Keegan was one of the oldest hands in the game. He got into it during the war when welding made its first strides forward. He had been in the steel trade as a rivet boy, then riveter since he was sixteen. When an electric welding school was begun, he signed up as one of the first pupils. After a year in the school, he was ready to weld any kind of joint from any position. He was even able to weld overhead, which is the hardest job a welder can be asked to do. Overhead welding is dangerous as well as difficult. The welder is constantly working with molten steel and a torch of flame. Each time he reaches for his work beads of liquid fire may fall back on him.

Tom not only mastered overhead work, but on one occasion he successfully welded two pieces of metal when he could only see his work by looking in a mirror!

The basis of electric arc welding, and Tom Keegan's bright magic, is the generator and the incomplete current. The generator which supplies the electricity, is kept at the bottom of the building. The negative wire is attached to the generator at one end and grounded, that is clamped, to the steel columns of the building at the other end. The positive wire, carefully covered, is led up through the building to wherever there is welding to be done. At the working end of the positive wire is a pair of tongs called the electrode holder. It is with this electrode holder that Tom Keegan does his work.

The electrode, for all its fancy name, is only a short steel wire about fourteen inches long which can be held in the electrode holder. Each electrode weighs about one-half ounce and a quick worker will melt up about three pounds of electrodes in an hour.

When he is ready for work, Tom Keegan puts on his gloves and mask. He grabs the electrode with the electrode holder, which looks like a duck's beak. He bends the electrode to a convenient angle and touches it to the pieces of steel to be welded. Instantly the current is complete. The electricity comes from the generator up through the positive line and down through the steel columns (which are excellent conductors) to the negative grounding line, and from there to the generator. The circle is complete and the current is on. This current is not strong enough to hurt a worker should he happen to touch the electrified columns.

But it is the *incompleted* current, the short circuit, that gives Tom the flame with which he works. He pulls back his electrode a fraction of an inch. Here he needs all the skill that years of experience can give him. If the sudden burst of flame and sparks unnerves him and he pulls back too far, the flame will go out. He must keep the electrode, which is at the end of the positive line, at just the right distance from the steel column, which is connected to the negative line. Then the current will jump across the circuit, and this jump makes a burning arc. It is with this arc, caused by short circuiting, that welding is done.

The heat of the arc melts a small area in the steel plates that are to be joined. The electrode or welding wire melts also and mixes with the melted steel of the two plates. As Tom lifts away his electrode the arc goes out, the metals cool and the two plates are firmly fused together. They are not only sandwiched by the hardening of the melted electrode, but by bits of themselves, fused one with another.

If Tom is keeping his arc at the right distance, there will be a slight crackling noise, a dazzling light, and a smell of burning metal. The crackling sound is one of the guides that tell Tom if his arc is steady and if his hand is at the right distance from his work. His glasses are so thick that they are hard to see through in ordinary sunlight, but against the welding light he can see fairly well. For the most part, though, the welder depends on that sixth sense which every good workman understands, the "feel" of the metal as it is being worked.

Tom Keegan is short and wiry. His face is wrinkled from peering through thick glasses and from working out of doors. His dark tan comes partly from the sun and wind, and partly from the burning ultra-violet and infrared rays of his arc. He has on a thick cap to keep the sparks from his hair, leather gauntlets to protect his hands and wrists, and a heavy overall suit that covers him completely. If he is going to weld overhead he will need still more protection, to prevent drops of molten metal from falling on him and burning through his clothes.

Tom Keegan's work isn't just on buildings. You'll find him in the shipyard helping to turn out the sleek ocean greyhounds that are bringing Europe closer every day. And you may see him at work right in your own city street repairing worn trolley tracks.

Welding has taken to the air too. The latest model airplane will have spot-welded wing structures to help it cut through the sky. Spot welding is quite different from the heavier arc work used on buildings and ships. It is done with a machine that presses the metals to be welded between two copper electrodes. When the current is turned on, the metal is softened by the heat of the electrodes, then pressed tight. When it is finished, it looks like the neat stitching of an efficient sewing machine.

Spot welding is used in a hundred other ways. It was used on the *Burlington Zephyr,* the new streamlined train, that burns up the miles at a 120-mile-an-hour clip. The *Mark Twain* and the other trains that are giving the *Zephyr* a run for her money, are also covered with gleaming steel sheathing that was put on by spot welding. Spot welding is used on automobiles too, and wherever efficient, lightweight work is needed.

But the most dramatic side of electric welding is the arc welding that Tom Keegan uses on the top of a skyscraper. Distance lends enchantment and Tom looks like a magician. If you stand stretching your neck to look at him you will be sure that it is no ordinary human who uses that weird fire so far above you. Watch Tom as he swings out over the city. He is careless of heights, disdainful of space, concentrated only on his searing light.

COURAGE OF STEEL

STEVE HENDON came out of the superintendent's shack trying to hide a grin. He had landed the job! With Tech over only a week ago he was already a steelworker. It was all Steve could do not to tell the first person he passed.

Steve crossed the street and then stopped to look back to where the steel framework towered above the neighborhood. This was the greatest building feat in years and he was to have a part in it. He was only going to be a rivet boy but at least he would be a regular worker. This was no summer job like the ones he had had before.

The Hendon family were all in the building industry. On the way home in the subway, Steve thought about relatives who had started out as rivet boys and were heads of departments before they were thirty. Next he indulged in daydreams about his own career and planned how he would tell Uncle Sam the good news about his job. It was an unusually pleasant subway ride.

Uncle Sam really was pleased. It was just as much fun telling him as Steve had hoped. That night when they sat down to dinner it seemed more like a banquet for a winning Tech team than just an uncle and nephew dining together.

"You see," Uncle Sam was saying, "if Oscar Gunderson hired you it really means something. He's about the keenest judge of character in the steel business. He could have been promoted a dozen times but he likes being the foreman on the job and being near the men. And that's his genius. In thirty-odd years at work they say he's never picked a dud."

"He's a grand looking old bird," Steve said, "tall and straight and sunburned. He looks just like a picture of an old viking."

"You get a recommendation from Gunderson," Uncle Sam went on, "and the whole office will listen to it."

"I'll do my best," Steve said, but Uncle Sam wasn't listening. "There's one other thing in the steel business," Uncle Sam was saying, "and that's not to let yourself be beaten by your own fear. *Fear doesn't matter.* We all meet it sooner or later. The point is how you conquer it."

Steve thought that last sentence was rather a comedown. After all, Uncle Sam didn't think he was a coward, did he? In Tech he'd gotten his letter in football and skiing, and those sports weren't usually meant for sissies.

The next morning Steve reported bright and early on the Fidelity job. He was assigned to the Reilly gang and the Kennedy gang and told to keep them both supplied with rivets. His first actual piece of work was taking a keg of steel rivets up to the thirty-sixth floor.

The first twenty-five floors were easy. He rode up in the temporary hoist. The next ten floors he had to walk up a wooden stairway. After that there was a long wooden ladder between himself and the top of the building where the derrick crews and riveters were at work.

Steve stopped to get his breath at the beginning of the ladder. He was very hot and he wanted to cool off. Here there were no walls to stop the breeze. There was only the steel skeleton of the building and a half-finished concrete floor. At one side Steve could look all the way down to the street. Even the trucks coming up from the river with loads of steel looked small from this distance.

Soon Steve started up the ladder. He held onto his rivet keg with one hand and the ladder with the other. Rung by rung he made his way steadily upward. It would have been very easy to slip but Steve didn't think about that. He had yet to learn what it was like to be afraid.

When he reached the end of the ladder, Steve was on the top of the building. The concrete floors hadn't gotten that far. There was only the steel framework and for a short space around the ladder there was a temporary flooring of loose board laid across the steel beams.

There was a terrific noise coming from three riveters who were working on a little wooden platform a few feet from where Steve was standing. Beyond them on another platform stood the heater.

The heater poked viciously at a small open forge that stood in front of him. Every so often he grasped a red-hot rivet out of the coals with a pair of tongs. There was a shower of sparks as he knocked it against the side of the stove. In another minute the hot rivet was hurtling through the air. Steve gave a little grunt of applause as the catcher landed it in his small tin bucket.

The heater signaled to Steve to come across with the rivets. Steve looked ahead of him. The heater was on a platform that was about forty feet from the wooden planking where Steve stood. The only way to get there was to walk across steel beams about twelve inches wide. One false footfall would send you hurtling down to the temporary flooring of the thirty-fifth floor. Steve swung the keg more firmly on his shoulder and started over. After all, this was no more than was expected of him. He went across and delivered his rivets without difficulty.

After a few days Steve became quite used to the noise, and the showers of sparks and the hot wind. The sight of the derrick crews swinging long upright columns of steel into the air no longer amazed him as it had during the first days of his apprenticeship. It was the derrick crew's work to erect the steel just as it was the riveter's job to rivet it permanently together. It didn't strike Steve as especially marvelous or wonderful. It was just steel work.

Early one morning of Steve's first week at work, Reilly sent him for some extra-long rivets. These were the kind usually used for bridges but the size of the Fidelity building made it necessary to use them in joining some of the steel sections. Steve went down to the third floor where the supplies were kept.

The floor of the third story had long ago been filled in with cement. There was only one open space about the size of a large room where the bare steel was not yet covered. There had been some last-minute change in the architect's plan which had caused it to be left unfinished.

It was perfectly simple to walk around the opening, but Steve and the other rivet boys walked across the open beams to the supplies. Steve took two steps forward. Without warning his feet shot out from under him.

In another instant he had fallen back onto the steel beam. He clawed the air wildly. At last his hands caught around the upright column nearby. With his arms over his head he held himself steady while Gunderson and two masons ran toward him.

The men reached him in an instant but it seemed to Steve that half of his life was spent before they got to him.

"All right, fella," Gunderson said, when they had pulled him onto the cement floor. "I guess you're safe."

"How did it happen?" Steve asked with one hand on his wrenched back.

Gunderson looked at the beam and then at Steve's shoes and back again. "Grease," he said briefly. "Just one blob of grease. Probably dropped there from the derrick. You stepped on it, and it took you for a ride."

Steve sat down suddenly. For the first time in his life he felt faint. His stomach was queer and everything was spinning.

"Stay here for a little while," Gunderson said. "I'll send up the water bucket to you."

In a little while another rivet boy came with the water. "You don't look sick," he said. "Is your back O.K.?"

Steve grinned and drank some of the water. It wasn't his back really. That was wrenched, but it wasn't badly hurt. It was just that he felt as though he were still falling. He felt shaky and queer and the sight of raw red beams made him sick.

A half hour later when Gunderson came by, he was still sitting there. "Guess you're all right now, aren't you?" Gunderson asked.

Steve got up awkwardly and nodded.

"Well, get to work then. Reilly'll be needin' more rivets."

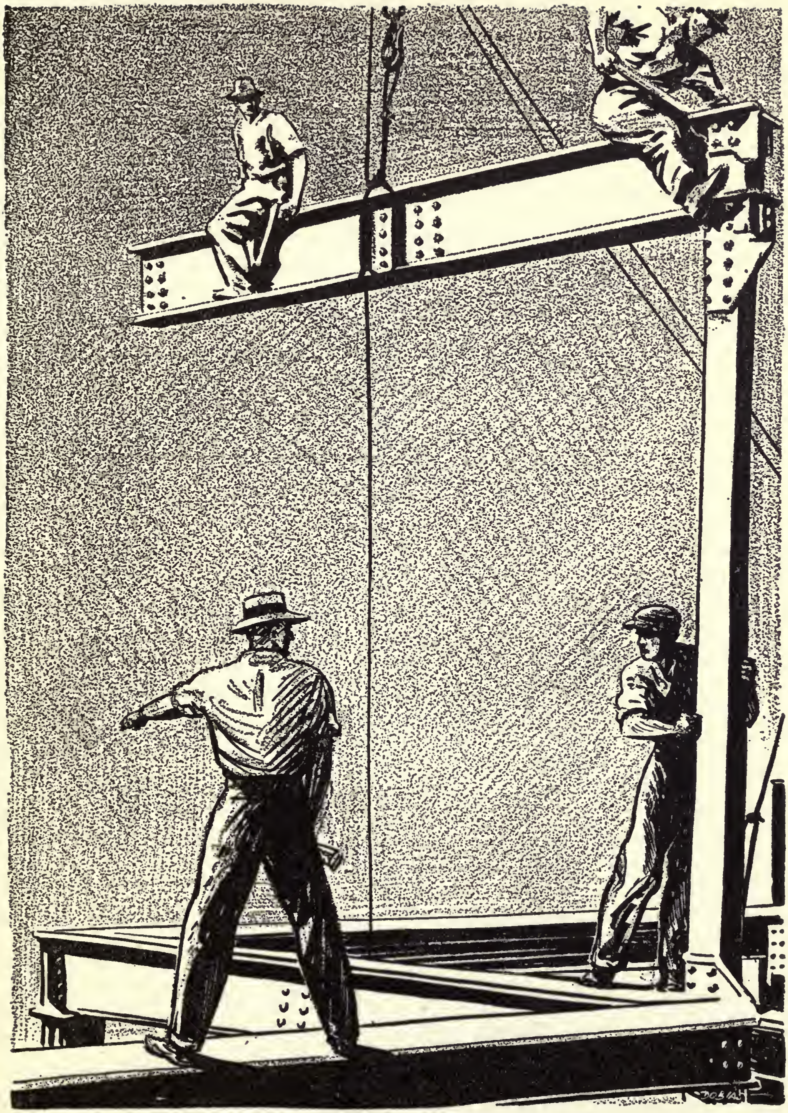
While Gunderson watched, Steve straightened himself and walked around the opening. No more sliding on grease spots for him. He picked out the keg of rivets and started off. He back ached a little and his knees and his mouth felt funny.

Gunderson went up in the hoist with Steve and followed him up the wooden stairs. When they got to the ladders, Steve hesitated. "What are you waitin' for?" Gunderson asked.

"Just resting," Steve said, but as he spoke he knew that it wasn't true. He was scared! For the first time in nineteen years Steve was terrified. That fall had done the trick. His nerve was gone.

"Planning to spend the day here?" Gunderson asked.

Steve shook his head. Up through the ladder shaft he could catch a glimpse of the derrick crew. Their work was more dangerous than the riveter's, infinitely more dangerous than his own. Was it only yesterday that he had thought these heroes were no more than other men?



"Now," said Gunderson, "walk out there and come back."

"Are you going?" Gunderson asked.

"I c-c-can't," Steve said.

"You go *now!*" Gunderson thundered.

Steve turned to look at him. His icy blue eyes were flashing. His color was higher than usual and his white hair seemed to have stiffened.

Despite himself Steve got up that ladder. When they reached the top Gunderson stopped and looked at him. "A steel worker's licked when he's afraid," he said. "You had a fright today. Well, now you've got to prove to yourself you're not scared. Give Eagle those rivets and come back here."

Steve did as he was told. "Now," said Gunderson, "walk out there and come back." Steve looked to where he had pointed. It was a long steel beam leading out over the street. It was the main beam of the final setback. Only the tower would go above that.

Steve had walked out there yesterday but now he knew he couldn't. The noise of the riveting hammer seemed to break down his nerve. He stood at the edge of the beam and the city swayed before him. "N-no," he said.

Just then the riveting stopped. The riveting gang saw that something was happening and walked over to where Gunderson and Steve were standing. As the men came toward them Gunderson's expression changed. "D'you see that?" he asked Steve, pointing. "Well, that's the Nelson Tower. We built that in 1930."

"Wh-what?" Steve stammered and in the next minute Gunderson had disappeared down the ladder. It wasn't until the four riveters had gone back to work and Steve had started for another keg of rivets that he really had understood what had happened. Gunderson had faked his interest in the building as a blind. He had kept the other men from knowing that Steve had turned coward!

The next morning Steve woke up stiff and sore and uncomfortably certain something was wrong. What had happened? When he rolled over on his back, Steve remembered the whole thing. He had lost his nerve over that grease spot accident. Then Gunderson had told him to walk on that beam and he hadn't dared. As far as Gunderson was concerned he was a dud. Steve knew all too well that what Gunderson thought went a long way in the steel business.

It was harder going to work that day than anything Steve had ever done before in his life. Somehow he forced himself to do it. He had to go! If he threw up this job Steve knew that as far as the steel industry was concerned, he was out. There wasn't a single member of his family who would lift a finger to help him unless he made good.

That whole morning was one long agonizing fear. For the first time in his life Steve knew the torture of unconquered panic. Every time he passed the beam on the last setback he shuddered. All his terror was now centered around that beam. If he could go out on it the way Gunderson had dared him to, he would be all right. In his heart Steve felt sure that he would never go out on it.

When the noon whistle blew, Steve took a deep breath.

It was Saturday and he was through for the day. Perhaps by Monday he would get up the nerve to go out on that beam.

Gunderson was standing on the top of the building as the men filed by. Steve looked away but Gunderson stopped him. "Now it's coming," Steve said to himself. "He's going to make me walk that beam. I won't do it and he'll fire me."

Nothing of the sort occurred. Gunderson waited until all the derrick crews and riveters had left. He spoke a few words to the timekeeper, nodded to the watchman and beckoned to Steve. "Won't keep you long," he said. "I just want to get the rivets under cover that they left up top. Looks like rain."

Despite himself Steve grunted as he started down to the third floor with a keg of rivets on his shoulder. Was Gunderson getting fussy? This was something new, taking all the rivets back to the supply base. They had been using several different weights that morning. He would have to make two trips.

Steve panted up to the top of the building again. The hoist man had left and he had to walk. It was a suffocating day. When he reached the top of the building, the sun was burning down full strength. Gunderson seemed to be testing some of the newly riveted sections. He looked hot, too.

Steve neared the top for the second time. He was nearly through and Gunderson hadn't mentioned yesterday. When he reached the top, Steve instinctively looked toward the beam. Suddenly his breath stopped.

Gunderson was lying across the beam!

His sunburned arms hung limply on either side of the painted steel. His worn shoes pointed downward and his head was full in the glare of the merciless sun.

In an instant Steve understood what had happened. Gunderson had sat down on the beam and had leaned down to look at the plates underneath it. The sun had caught him full in the back of the neck. He had dropped just in that position from sunstroke.

Steve looked around him feverishly. Everybody had gone. He knew that there was no one nearer than the watchman on the third floor. Would he have time to go down there for help?

Steve looked back at Gunderson and knew that there wasn't time. There was no wind, but at any moment Gunderson might come to. In waking he would be sure to fall.

Steve sat down at the edge of the beam with a quaking heart. In all that midsummer glare he felt suddenly cold with fear. Without knowing why, he thought of Uncle Sam. "Fear doesn't matter," Uncle Sam had said. "The point is how you conquer it."

Slowly, fearfully, Steve clutched the hot steel with hands and knees. Inch by inch he made himself go forward. Halfway out he looked down at the dizzy pattern of the city beneath him. For a moment he was caught in a surging, choking wave of panic. Slowly he fought down his terror and forced himself to go further. "Fear kills you or you kill it," he told himself grimly.

When he reached Gunderson he was so hot that he felt as though his eyes were on fire. The painted steel that he was sitting on was a fiery grill. Each time he gripped it he felt that he left behind some of the skin of his hands. The sun at the back of his head was steady torture.

Steve gripped the beam as hard as he could with his knees. With one hand he clutched Gunderson's hot body.

At that moment Gunderson sat up very straight, ahead of him on the beam. Steve stared at him. Gunderson wasn't unconscious! Steve held on to steady himself. Was he seeing things?

But Gunderson turned around and his face was laughing. Slowly Steve understood. He'd been taken in, fooled. Gunderson hadn't had a sunstroke at all. He hadn't even been dizzy!

"Get back to the platform," Gunderson said, "and I'll explain."

Steve began to move slowly backward and all the time he could hear Gunderson laughing and laughing as he followed him back.

Suddenly Steve was furious. "What is this?" he demanded when they were both standing on the board platform. "What's so darn funny? You lie out on the edge of nothing as though you'd had a stroke and then all of a sudden you sit up and laugh your head off."

Gunderson could say nothing at all. He still just looked up at Steve and roared with laughter. The more he laughed the madder Steve grew. "Go ahead and howl," he said. "Go right ahead. It's a cinch once you've made a fellow risk his neck to save you."

Suddenly the smile left Gunderson's face. He walked toward Steve, his hand outstretched. "I'm sorry, son," he said. "I'm really sorry. It looks like a downright rotten trick but it had to be done. It was better to fool you like this than to let you fool yourself into thinking you were meant for the steel business if you weren't."

Steve was still too hot to be anything but angry. "I don't get you," he said.

"It's just this," Gunderson said. "When I hired you I thought you looked like a good thing. Then yesterday I wasn't so sure. I knew I'd save both of us a lot of time by pulling a stunt, and I did it. And now I'm satisfied. One hundred per cent."

Steve said nothing but somehow he couldn't seem to stay very angry. He held out his hand and Gunderson squeezed it. "Tell your Uncle Sam I say you'll do," Gunderson said. "You'll do very well indeed."

WEB OF STEEL

The Suspension Bridge

SUSPENSION bridges surpass any other steel structure for sheer beauty. Their towers are as tall and straight as great fir trees, their slender cables as gossamer as silk.

The first man who used a bridge may have crossed on a fallen tree or used stepping stones. Whatever his method, it was a long, long cry from the curving splendor of the Oakland Bridge in California or the mighty Tri-Boro in New York. What the prehistoric log and the modern suspension bridge have in common is the ingenuity of their inventors and the daring of their builders.

It took courage to cross the dark, prehistoric river on a fallen tree. The water was deep and swift below, and who knew what angry river god waited for the impudent land creature who dared to cross his territory? It took the same courage to bridge the wide bay of San Francisco, or to span the tricky tides of Hell Gate in greater New York. The builders had generations of experience behind them, but their problems were new and they met obstacles that had never before been overcome.

The building of no two bridges is exactly alike. The contour of the land varies with every location; the reaction of tide and current is different in every river. Above all, the traffic that the finished bridge must bear is a problem that grows in difficulty and complexity with every year.

The towers are the twin starting points of a suspension bridge. They are built first and they must be built as strongly and well as possible. They rise three hundred and more feet from the rock on either side of the river and go straight up like squat imperious skyscrapers. They are the weight-carriers, the load-bearers of the bridge. From the top of these towers will be slung the steel cables. From the cables will hang the deck of the bridge, which is the roadway over which men and automobiles pass.

The towers are built of steel beams and girders. These great sections of steel are usually specially constructed in a steel mill and then sent up to the site of the bridge as they are needed. They are hauled into place by a derrick, temporarily bolted by a raising gang and finally riveted for good by gangs of riveters. The work requires exactly the same spectacular routine as goes into the building of a skyscraper.

In order to hold the cables and the weight of the bridge, the towers must stand on solid rock. Sometimes rock is near the surface of the river bank and the work is fairly easy. At other times men must dig through clay, or mud, or shifting sand in order to find a solid enough foundation.

After the towers, come anchorages of steel and concrete. These are built directly behind the towers on either side of the river and are designed to keep the cables in place. The cables will be run over the tops of the towers and then fastened into the anchorages.

All this sounds fairly simple and it isn't strange that people thought of suspension bridges long ago. In remote parts of India, men have built hanging bridges of twisted grasses and grapevine for centuries. The idea is simple enough to grasp, but carrying it out so that the bridge will be strong enough to carry thousands upon thousands of ton weights of automobiles, trucks, and trains is a triumph of the steel age. It is only in recent times that men have outwoven the spider and spun a net of steel!

When the towers on the Tri-Boro Bridge were completed, the engineers on the job took a steel rope from the west tower across the river in a boat. Then a derrick lifted the rope up to the top of the east tower, and it was run across and fastened down to the anchorage behind the east tower.

Three other ropes were also taken across the river in a boat and lifted over the top of the towers and fastened behind them. The ropes were divided into two pairs; one pair on either side of the towers. These pairs of ropes were the beginnings of the two catwalks.

There are always two catwalks on every suspension bridge. They are built of wooden planks fastened between each pair of the pioneer wire ropes that first connected the towers.

The men who build the catwalks have the most dangerous job in bridge building. They begin by going up to the top of the towers three hundred or more feet up in the air. There is nothing for them to cling to, nothing for them to hold onto. There is no net, nor rope, nor other safety device to catch them should they make a single false move.

They begin with two of the ropes that have just been run across the towers. With these ropes as sides, the men must build out in front of themselves. They are working in the air with a deadly drop in front of them, but they lay their planks as calmly as though they were working on a board path three feet above solid earth. They fill in the spaces between the boards with wire mesh. This mesh will keep other workmen from falling, but there is nothing to keep the catwalk builder from a fall, except his own clear head, his invincible nerve, and his monkey's skill in climbing.

The Romans believed that the river gods were jealous of bridges; and that for each bridge built there must be human sacrifice. If you watched a catwalk builder you would agree with the Romans. The builder only needs to slip once to lose his life in the river.

Even after it is finished, the catwalk is a risky walking place. The steel ropes on which it is built drop sharply from the top of the tower on the east side, down toward the water, and then rise as sharply up again to the top of the tower on the west side.

The walk is as narrow and steep as any mountain trail and a thousand times less solid. In a high wind, the catwalk will swing and sway like a sailor's hammock. It won't turn over and drop you into the river because of the storm cables that lash it to the shore, but it will move and sway with every step you take. There are rope handrails on either side, but these are but slight comfort when there is a three hundred foot drop below you!

About the time the catwalks of a suspension bridge are finished, some of the coils of wire rope for the great cables will have been delivered from the rolling mill where they are made. The wires used in most bridge work are three-sixteenths of an inch thick and are mounted on great wooden drums that look for all the world like giant fishing reels. These drums are kept at the anchorages behind the towers.

Before the spinning of the cables can begin, a guide wire must be run across each of the catwalks. It is just like all the rest of the wires of which the cable will be spun. It is only more important because it is the model, the measuring tape, against which all the other wires will be measured and compared.

The engineers on the job must know to a fraction of an inch how long the guide wire is. They must also know exactly how sharply it will curve down toward the water. Before the first steel wire is spun, the engineers will have spent weeks in calculating the exact curve, or sag, that they want it to take.

These calculations are only the beginning. On the Tri-Boro Bridge the engineers even went to the expense and the trouble of making a model cable five feet long to make sure that if the cable were hung in a certain curve it would be able to bear the load expected of it.

When the catwalks and the first guide wires are all in place, the human spiders can really begin. The men stand on the wooden planks of the catwalks and spin over their heads. Their spinning equipment is a trolley wheel which is mounted on a wooden framework over the catwalk. The trolley wheel runs on an endless pulley and is usually hauled back and forth by an electric hoist.

The actual spinning consists of looping one end of the wire coil over the wheel, running the wheel the length of the catwalk, taking the loop of wire off the wheel and fastening it to the anchorage on the far side. After each crossing, as a loop of wire is taken off the trolley wheel and fastened to the anchorage, a new loop is put on the wheel and run across to the other side. Thus while the wire is being spun, the drums that hold the wire coils are continuously unwinding.

As the trolley wheel carries the wire across, men called adjusters stand on the catwalk to see that each wire is exactly even with the guide wire. The adjusters stand and signal to one another. They signal with flags or, on some of the most modern bridges, with telephones. When the adjuster nearest the eastern end of the bridge sees that the length of wire between him and the anchorage is at exactly the same tautness as the guide wire, he signals to the next adjuster to the westward. This man will match his length of wire with the guide, and signal in turn. By the time the wire is all the way across, it will have exactly the same curve as the guide.

When the trolley wheel bearing a fresh loop of wire reaches an anchorage, the loop is taken off the wheel and fastened. This is done by looping the wire around a giant knob, called the "standing shoe" which is a part of the anchorage.

When a whole drum of wire has been used up, the end of the wire is screwed on to the end of the wire of a new drum. All the wires are made with small screw sockets at either end so they may be fastened in this way. In order to be especially safe, the newly socketed ends are also submitted to terrific pressure to squeeze the metal of the two wires together so that they will never come apart.

The number of these individual wires used to make up a strand differs on different bridges. In some bridges there are ninety-five wires to a strand, in others as many as three hundred. When all the wires of a strand have been spun they will be wrapped with iron bands to keep them permanently together. These bands are narrow strips of iron with a hole at one end and a tongue at the other. The band is wrapped around the wires, the tongue thrust through the hole, and bent back. This is a belt that will never come unbuckled.

In the Tri-Boro Bridge there were thirty-seven strands with ninety-seven individual wires in each strand. But even when all thirty-seven strands were completed, the cable was not yet finished. The strands had to be squeezed together under terrific pressure so that they would form as tight and perfectly rounded a core as a single giant wire. This compressing of the individual strands was done by an hydraulic jack capable of exerting an incredible amount of pressure.

When the towers have been erected and the cables spun, much of the work of a suspension bridge has been finished; but it still doesn't look like a bridge to most of us. The deck, which is the part of the bridge we use to travel over, has yet to be hung from the cables.

If you have ever seen a finished suspension bridge you will have noticed that there are fine wire ropes holding the bridge deck to the cables. These are the suspenders from which the suspension bridge gets its name. The suspenders are actually lengths of the four original wire ropes that the engineers first took across the river in a boat and on which the workers built the catwalk. Once the cable is all spun there is no more need for the catwalk. It is taken down, and the wire ropes which are the most important part of it are usually sent back to a steel mill to be cut into the proper lengths for suspenders.

In order to hold the suspenders, castings are bolted on to the two great cables at regular intervals. When the suspenders are brought back from the steel mill, they will have especially made socket ends which will be permanently screwed and bolted into these.

The building of the deck is another operation that requires a skill and courage all of its own. The men begin erecting the steel of the deck at one side of the river and work outward across the water to the other side. The main girders of the deck are bolted to the suspenders that hang down from the two cables. Then smaller girders are attached to these greater ones. Perhaps it sounds like loose makeshift weaving that might come apart in the first storm. Actually, however, the deck is built so strongly that thousands of people will cross over the river as safely and as solidly as though the roadway had been laid on solid earth instead of on hanging steel.

Men had to be master builders in steel before they could attempt suspension bridges. The bridge builder must work with skill and strength and ready courage. If one man is injured or killed another has to take over without flinching. He risks his life over and over for little more than a living wage. He works a lifetime and is never recognized for the hero that he is. He is one of the builders of the pathways of progress—but he builds at a cost.

WHY BOTHER WITH LADDERS?

WHEN the red towers of the Tri-Boro Bridge began to shoot skyward, Jim Burroughs signed up for work. The first columns were tall and bare and they stood out grimly against the black rock of the river bank. Jim stood back and looked up at them as they faced each other across the whirling river. Erecting these towers would be a real job, and, after a year as a rivet boy Jim was just looking for trouble.

When he heard that he was to carry rivets for Chad Rivers' gang, Jim decided that everything was breaking his way. Rivers' gang was the best in the city and it had a reputation for nerve that was unique even in the steel business.

The first morning at work Chad sent Jim down for some special bridge rivets. When Jim came back the gang began to drive them and he had a chance to watch. The rivets were about the longest and heaviest made, but the men handled them like carpet tacks. Chad strained at the hammer, the muscles of his back taut as an alder bow. His left leg was stiff from an accident years ago and he kept himself in position with his right. He looked awkward but there was nothing awkward about the way he handled the gun.

Jim looked at the heater. He was a small Irishman called Flaherty who was so short that his shoulders hardly came even with the forge. Chad's brother, Bill Rivers, was the bucker-up; and a thin, dry looking Swede called Olafsen was the catcher.

The men kept the red-hot rivets flying between them. They worked as though one brain guided them all. As Chad turned on his gun, Bill leaned on his dolly bar as though their two backs were part of one body. Olafsen and Flaherty caught and threw the rivets without having to speak. No one thought what the other was going to do next. Each man knew!

The sparks flew, the steel rang, and the big shaking hammer beat out a war dance. Jim grinned at the noise and the heat. There was excitement, and fire, and skill in the work of these men. More than he had ever wanted anything in his life, Jim wanted to be one of them.

By the end of three months' work it looked as though Jim were going to have his chance. The winter was warm and wet and unhealthy, and there was a "flu" and pneumonia epidemic. One day in February Chad came to work with a long face. Jake Olafsen was in bed with pneumonia. "You'll catch today," Chad told Jim. "When Olafsen gets well you'll go back to toting rivets."

Jim said nothing but picked up the battered can with eager fingers. He'd show them he could catch.

Flaherty turned his blower handle and fanned his coals. When the rivets gleamed with heat he grabbed one with his tongs. "Ready?" he shouted to Jim.

"You bet!" Ready? Jim had never been readier in his life. Catching hot steel was what he was made for. Jim had come home.

The first rivet plunked in his can. Jim lifted it out for Chad to drive. He hadn't been practicing catching at lunch hour for nothing. He was as good at catching as he was at climbing and he knew it.

The first day ended successfully and so did the second. On the third Chad came to work with a mouth as set as a double steel brace. "Olafsen's washed up," he said. "He's through. He'll live, the doctor says, but there's not a chance of his riveting again. Foreman says he'll give him a job as a timekeeper."

Jim's heart beat very fast. If Olafsen was through he had a chance. Who else would they take on as permanent catcher to their gang? He looked up to ask and the words died on his lips. The other men had forgotten that he existed. Little Flaherty was crying openly and unashamed. Chad's steely mouth was harder than ever, and Bill's gray eyes had traveled out over the span of the bridge for comfort which he couldn't find.

Jim put his hands in his pockets and moved off. You couldn't blame them for grieving the loss of a good teammate. But in time they would come back to the present; then they would make him a member of the gang.

But February eased into March and nobody mentioned Jim's becoming a member of the gang. Once Jim spoke of it to Chad and Chad cut him short. "When we want a new member in this gang," he said, "we ask him. This is a racket where you can't make mistakes." He nodded at his gun, the forge, and Bill's dolly bar. "You can't just guess about the man who's going to handle these trinkets day in and day out."

Jim had nothing more to say. Any fool could see that one slip in riveting might be fatal. If the catcher missed the rivet it would strike the gunman. If the gunman was careless he would blow the bucker-up to kingdom come. Their lives were as closely interwoven as the reeds of a basket.

Each day Jim went to work feeling more discouraged. He was doing riveter's work and he wasn't being paid for it. He wasn't even laying any foundation for another job. Men were hired and fired by gangs. Unless Chad and the others recognized him as one of themselves, when it came to signing up on a new building, he'd have to begin all over again as a rivet boy.

Jim nearly forgot to eat his lunch. It wasn't just the pay. It was the three men sitting on the remotest corner of the tower that made it hard. Working with them gave riveting the drive, and the excitement that meant more to Jim than money. They were the kings of their trade and they didn't know he was on earth.

Jim walked toward them and realized that Bill Rivers stopped speaking when he came up. Jim felt a lump in his throat that he hadn't felt since he was about six. They needn't act as though he had leprosy. He didn't want them to make a fuss over him; he just wanted to be one of the crowd. To shove his clothes in the same locker box in the morning, to walk home with them at night, to work with the proud knowledge that they trusted him as they trusted one another.

They started work again and then Jim had an idea. What they wanted was a demonstration. They knew he could catch rivets and climb around a bit, but how'd they know he had more than ordinary nerve? Not minding high places wasn't enough. Where they worked, they never saw men who were afraid of heights.

Jim hitched up his trousers between rivets and for the first time in days a broad grin settled down between his ears. He had an idea and he'd show them. Danger was just his meat. Hadn't he been looking for trouble ever since he went to work? Didn't he want to belong to Rivers' gang just because it was known all over that they took jobs other gangs were afraid to tackle?

He waited until they were ready to go home. At five o'clock the three men crowded around the ladder on Flaherty's platform to go down—then Jim pulled his trick.

He flapped one of the platform ropes around a beam and down over the outside of the tower. He would beat them to the next floor by sliding down the rope! It was a trick to make anyone sit up.

Jim looked down at the rocks and the river endlessly far below. If his hands slipped—if he lost his balance for just a fraction of a second! Jim didn't hesitate. He'd show them something new. They couldn't ignore him forever.

"Coming down?" Chad Rivers asked.

Jim's heart thumped. Now was his moment. Every man jack of them was looking at him. "That way's too slow," Jim said. "Why bother with ladders?"

In another second he had let himself over the side!

He heard Chad call out and the high Irish voice of Flaherty. Jim let himself down hand over hand. Now that he was in the midst of it he felt fine. He'd show them he had Olafsen lashed seven different ways.

He worked his way down until he saw the red beams of the floor below, just a few feet away. He let himself down gingerly and reached for the welcome steel with his toes. He held onto the rope until he had a steady foothold and then let go.

Jim turned and walked the narrow beam to the center of the tower where the men were coming down the ladder. One false footstep and he'd be gone; but he wasn't thinking about false footsteps. He was thinking about the other men and what they'd say to him. Jim swaggered down toward the center of the tower to meet them.

He went quite close to them, waiting for someone to speak. Then slowly it dawned on him that none of them thought it was nearly as bright as he did himself.

"What was the point of doing that?" Bill Rivers said finally. "You're supposed to be a riveter not a human gorilla. People that take chances to show off usually haven't the stuff in a pinch."

Jim looked at Chad. Surely he would recognize a good show? He would understand why Jim had done it. Chad did understand! "That kind of nerve's not worth a hang," he said. "It's not just a flash-in-the-pan we want. It's endurance. You've got to know that a man can take it at the end of overtime when every rivet looks like a bomb and the hammer's another machine gun. You've got to know a man'll pull for the rest of the gang even if he's half dead himself."

Jim said nothing at all. If he'd ever felt flat in his life that was the moment. The other men walked down the stairs and Jim fell in silently behind them. The future spread out bleakly before him. So courage wouldn't do. They wanted to know a man for months, years maybe, the way they had known Olafsen. The months yawned endlessly ahead. If he let them down just once in years and years he'd be through.

The next day was cold and raw, with a taste of rain in the air. Jim turned up his collar and went up the stairs and ladders to the top of the tower. All the hope and enthusiasm that had kept him going these past months was gone. Work was just work and nothing more. He wouldn't be one of the crowd before they moved on to another job and then it would be too late. He didn't have a chance of becoming a member of Rivers' gang!

It was cold and gusty, and the wettish wind made the steel beams treacherous. Jim looked up and saw that the derrick hands were not working above him. He shrugged his shoulders and went to work. He didn't blame anyone for not working on a day when the steel was slippery as black ice.

By eleven o'clock all the other riveting gangs on the tower had quit work. By twelve it was drizzling hard and the beams and girders were wicked. Jim expected Chad to give the order to stop at any moment but Chad said nothing. Jim looked at him and wondered. Every steel worker in the world knew that you couldn't drive rivets in the rain. Rain wasn't just dangerous on the top of a skyscraper. It was suicide.

Once they stopped and huddled around Flaherty's forge to gulp down coffee and eat their soggy sandwiches. "You going on working?" Jim asked.

"How about it?" Chad came back. "Does the trick rope climber want to quit?"

Jim's neck and face got a dull angry red. Chad was a fool, but if he wanted to drive rivets in a flood Jim didn't care.

Jim started back to his own platform. Suddenly he felt his left heel slipping but he caught himself and plunged to safety on the wooden platform. Jim's heart pumped in his throat! For the first time he knew what it was like to be petrified with fear.

"Don't cross," Jim yelled at the others. "Don't cross. It's terrible!"

The others looked at one another and crossed without speaking. Jim fumbled for his catcher's can. He had lost his nerve and he knew it and now the rest of the gang knew it! There was nothing for it but to work today and then to quit for good.

Jim fell in with the others, his whole body tense with apprehension and fear. He caught and thrust. Caught and thrust.

The afternoon darkened but still they stayed at work.

The drizzle turned to rain and the wind stiffened. Still nobody spoke above the volleying of the gun. When Flaherty was ready to throw a rivet, he beat on the side of his stove with his tongs. There were no other signals.

Once they stopped for a moment and Jim realized for the first time that he was shaking. He was drenched with sweat and his head reeled. Jim gripped his can and tried not to look at the river miles and miles below him. He was panicked! He, Jim Burroughs, who had been born for the steel trade, was beaten, because for one moment his foot had slipped in crossing a wet beam.

As they worked, the wind grew stronger, and stronger, until it seemed to blow directly on Jim's raw nerves. His cap blew off and whirled down, down out of sight to the river. His hair blew in his eyes. The wind was still growing, growing.

Jim caught a rivet mechanically and lifted it out with shaking tongs. His hands shook, knees shook; he hardly knew what he was doing.

Suddenly there was a shriek of pain. Jim stepped back to the very edge of the platform and at the same instant Bill began to swear. "You blasted idiot," he finished. "Are you so scared you can't even see what you're doing? You might have burned my hand off."

Jim looked at him and his heart stopped. He had burned Bill with the rivet! His shaking hands had pressed it against Bill before he had gotten it into the hole!

Jim could see the searing line deep through Bill's thick leather glove. It was a bad burn, and it might have been fatal. Any other man than Bill would have recoiled with the pain of it and been flung over the platform far out into the river. Jim looked at Bill and knew what he was thinking. Jim wasn't to be trusted. When he lost his nerve he went to pieces like a wild colt.

Before they had time to speak, there was a stronger gust of wind than ever. The very columns shook, and quivered. There was a sudden clap that echoed and re-echoed through the skeleton tower. It was the ladder! The long wooden ladder. Blown over backwards to the floor below!

"The ladder!" Flaherty bellowed across to them. "Gone!"

Chad dropped on all fours and started across to Flaherty's platform. It was still possible to crawl where you couldn't walk. He inched himself forward with hands and thighs. When he got to the platform he looked for Bill, ignoring Jim. "All right?" he bellowed.

Bill nodded and moved himself along the beam, wincing when he had to touch the steel with his aching hand.

Jim followed behind him. The dread ring of fear was around his heart and with it a hopelessness deeper than any he had ever known. He'd lost his nerve in a pinch and he'd hurt one of the gang. He was through.

By the time they were on the platform Flaherty was wild. He moved around the boards like a mad banshee. "We're licked! I tell you, we're licked! We're here for the night. With this wind growing we'll be blown to hell before morning."

Jim looked over the side to the dark river and the darker rocks. Nothing to keep them from falling, nothing to shelter them from the mounting wind. His eye caught the tower across the river. He looked down to the black water and then slowly, slowly up again.

"We'll never get down without a ladder," Bill said. "Never!"

"We shouldn't have stayed," Chad said. "I told you it wasn't worth it."

Only Jim said nothing. Slowly in the back of his mind he realized what he had to do. Somehow he had to get down to the floor below *without* a ladder! Chad couldn't with his stiff leg, Flaherty was too short to grip the steel, Bill's burned hand threw him out. Jim was the only one left. He had done it yesterday. He would have to do it today.

"I'll get down," he told the others and felt the tastelessness of rain against his lips. "I did it before." He hardly heard what they said. Something inside of him was frozen with fear.

"You'll never make it," Chad said. "Never in all this world. The wind'd snap you off the rope before you got two feet."

Jim shook his head. "I've got to," he said and wondered at the sound of his own voice. "Tie the rope around my waist. I'm going down the column."

Chad hesitated, looking toward the river. The wind was mounting steadily. In another hour the platform would be impossible. If they didn't get off soon they might all die. "Hurry up," Jim said and Chad hurried.

Jim kicked off his heavy shoes and moved to the edge of the tower. He mustn't look out, he mustn't look down. Three lives besides his own depended on what he was going to do!

Jim twisted his legs around the column and began to let himself down. Inch by inch he moved down the red column. His toes fought for a foothold on the rivet heads, he hugged the column like a bear on a pole.

He felt the skin of his water-soaked hands rise and tear off in patches. His stocking feet battered against the steel and the inside of his arms and legs scraped against the column.

His breath was gone and his mind reeled from the wind. Right now it bore down against his back and pinned him to the column. If it shifted for as much as one second he was through.

Down, down, down. Perilous inch by perilous inch. He was facing the river and he could see the opposite tower through the network of his own. "Keep looking up, looking up!" he told himself but it was useless. He wasn't even afraid any more. Just tired. Desperately tired like a drowning man who wants nothing but to let go.

Suddenly his toe stubbed against the crossbeam and Jim knew that he was down. He heard the men shout, but their voices were dulled by the wind. He let himself down so that he straddled the crossbar. He jerked himself free of the rope and began to go across inch by inch to the platform.

Slowly, carefully, he fought against the wind and the slippery steel. Finally the platform was just ahead and he pulled himself up on it.

He stood up, reeling as the full impact of the wind blew against him. He plunged forward and managed to reach the ladder.

He tugged and lifted it, still fighting his enemy the wind. Finally he had the ladder upright and let it drop against the side of Flaherty's platform. He could see the men lash it with rope. Then they began to come down.

By the time they reached the platform Jim was sitting looking dumbly at his bleeding hands.

"Well of all the pieces of nerve!" Flaherty's shrill voice pierced the shell of Jim's tiredness.

"You pulled something," Bill said. "What a comeback!"

Jim looked up at Chad and Chad nodded. "The genuine article," he said. "Pure unadulterated guts. To lose your nerve and then pull a stunt like that."

They moved down to the comparative shelter of the stair well. "The rain," Jim got out, "d'you often work in it?"

"Only this once," Chad said and neither his voice nor his face was hard. "Because we wanted to try a man out. We knew he had nerve but we didn't know what kind. Flash-in-the-pan won't do. We went on working to see if he could take it once he'd gotten a scare."

"And the ladder," Jim asked numbly, "did you frame that too?"

"You can bet not! I've never asked a member of my gang to do anything I wouldn't do myself."

"Of your gang?"

Chad nodded. "Of course," he said. "Once we find a guy like you, you don't suppose we'd let him go, do you? You've got to try a man, and try him again, and see him scared, and see him get unscared and then if he clicks, you stick to him."

The blood thumped back into Jim's head and he forgot his aching hands, or his bruised, battered feet, or anything except Chad's words.

"You mean I'm on?" he said. "Part of the gang? For keeps?"

Chad nodded but he could say nothing.

"You bet you're on!" Bill spoke with his burned hand thrust deep into his wet jacket. "You're on as long as any blooming one of us can throw a rivet."

FIRE AGAINST THE SKY

PETE HENDON eased his keg of rivets from one broad shoulder to the other and glanced at the river. For the last eight flights he'd been puffing up the steep temporary stairs that went up the unfinished eastern tower of the great Atlas Bridge. There was still a long climb between himself and the gang he was keeping supplied with rivets. He waited and let the breeze cool him off. He was glad he was working on the river side.

Two lengths of ladder rose from the planked floor in front of him and went all the way up to the riveter's platform. He was almost beside the ladder before he saw the boy cowering at the foot of it.

"Hello," said Pete. "What's eating you?"

The boy lifted a flaming red head. His face was so white that each freckle stood out like a wart. "That," he said, pointing to the ladder, "and th-this."

The "th-this" was the water bucket he was supposed to be carrying up to the riveting gang. Slowly light dawned in the back of Pete's head. This was Calhern, graduate of Master's Tech, whom Martin the superintendent had hired yesterday. Unlike Pete he was only temporarily at work on the bridge. He was being tried out on the field before Martin would give him a job in the office. As for

Pete, he wouldn't have touched an office job with a ten-foot pole. If he could just earn a few more dollars a week at his present job of toting rivets he'd be ready to celebrate. Even a dollar a week would help, Pete thought. He wouldn't have to walk to work from the boarding house where he was living.

Pete looked back at the ladder. It was long and straight and stood near the outside of the tower. To the left were the red steel beams and columns with half-finished cement arches. To the right was—space. Space, and far, far below the sharp rock of the river bank and then the coiling, whirling water of the river itself. Beyond on the other bank was the twin tower to the one on which they were working. When the towers were built the cable spinners would begin to weave their gleaming net but that was still a long way off. "It's not a bad climb," Pete said to the boy at the foot of the ladder. "Not if you just look straight ahead and keep going."

The boy didn't even look up. "In this wind?" he whined. "I'll starve first. Why should I risk my life for those riveting yeggs?"

Pete argued good-naturedly for a minute or two. He himself had been born in the steel trade and had no fear of high places. It seemed absurd to him that anybody should be afraid of something just because it was high up. He offered to follow Calhern up the ladder and to carry his bucket of water up for him. But it was no use. Calhern couldn't be persuaded. Pete started up, grasping the ladder rungs with his right hand and his keg with the left.

Rivets had to be delivered on time whether this college boy got the heebie-jeebies or not.

When Pete came out on the open square of wooden planking that surrounded the top of the ladder, he saw that Stumpy Mallory, the heater, was waiting for him.

"You're late," Stumpy growled. "What d'you think this is? A picnic?"

"Sorry," Pete began but Stumpy was noisily stowing rivets into his glowing coal forge.

Pete climbed back down the ladder again, grinning. Stumpy and the others were all right, no matter what Calhern thought. If Pete ever landed with a gang half so good he'd be happy.

At lunchtime Stumpy, the catcher, and Pierce and Reilly, the other two men in the gang, ate on the thirty-fifth floor where the rough cement arches of the permanent flooring had already been laid. A ladder rose near at hand toward the platform they had just left. Calhern sat by himself at a little distance from the other men. Pete looked at him and wondered if he had ever gotten the water up to the top of the ladder. It seemed he hadn't for Stumpy was standing in front of him, looking more like a small angry terrier than ever. "What's the big idea of not bringing up our water?" he demanded. "Rivetin's dry work."

"I couldn't," Calhern said in a high nasal voice. "That ladder's not meant for any civilized person."

Stumpy's guffaw rang out like the first crack of a riveting gun. "Hey, fellas," he shouted. "Did ya hear, we ain't civilized."

Pete moved uncomfortably, as the rest of the gang clustered around to see the fun. Calhern was in for a ride or Pete didn't know the symptoms.

By this time, Stumpy was probing into Calhern's past. "I'm an engineer," Calhern half sobbed. "I graduated with an honors degree. I'm not supposed to do the things you steel hunkies that are all back and no brains can do."

Pete groaned. It was all over now except the shouting. Stumpy had jerked Calhern to a standing position so that the new boy towered limply over him. "You go up that ladder," he ordered, "or else——"

"Aw, don't make him," Pete pleaded. "A guy can't help being afraid of high places."

Tom Bryan, the catcher, turned to him angrily. "Leave Stumpy alone, Rivet Boy," he warned. "Any more lip from you and you get taken for a ride yourself. We've taken all we're goin' to from this highbrow."

Pete could have kicked himself. He looked down at the river glistening below him. Now they probably thought he was scared to death too. Calhern was acting like a fool and Pete was equally a fool to have stood up for him.

Cowering with fear, Calhern crept up the ladder with Stumpy after him like a dog after a cat. Pete knew that if the boy had made one false step, the heater would have grabbed him at the risk of his own life. But to Calhern, Stumpy was only the more menacing of two dangers.

When they reached the top of the ladder his last shred of self-control disappeared. "I'll have you fired," his shrill voice floated down to the others. "I'll have you fired if it's the last thing I do. I might have fallen. To the rocks.

Into the river, anywhere. My uncle's a large stockholder in this comp—" His words were lost in a shuffle of footsteps, as Stumpy began chasing him across the platform.

"Now he'll catch it," Tom Bryan chortled. He was just starting up the ladder to see the fun when there was a crash overhead.

A shower of burning coals rattled down the ladder opening. There was a piercing shriek from Calhern and a muffled cry of pain from Stumpy.

"It's the forge!" Tom Bryan gasped. "They've knocked it over."

Pierce and Reilly dropped their sandwiches and dashed the water from Calhern's bucket onto the live coals. Tom hesitated, looked at Pete and then began to climb the ladder.

In a moment he backed down again, chased back by a shower of hot coals. "Those coals," he said. "They'll burn Stumpy's platform in a second in this wind."

"How about Stumpy and Calhern?" Pierce began.

"They can go down the other side of the tower on the Eagle gang's ladder," Tom shouted running across the rough cement flooring. "You go get help. Bring water and chemicals if you can. I'll see to them."

Pierce charged down the wooden steps while Pete and Reilly followed Tom.

In another minute they were on the east side, deserted during the noon hour. They raced up the ladder and then they were on a level with the fire but separated by the whole width of the tower.

Soon they were off the planking and going across the naked steel beams as fast as they dared. Ahead of them they could see the wind whip the flames into a roaring column of fire. When they got to Tom's platform thirty feet from the fire, the smoke was sharp in their nostrils.

"Look at Stumpy," Tom yelled. "The forge must have fallen on top of him." Even as they watched they could see Stumpy struggle out from under the legs of the forge that had pinned him down. He lurched forward a few steps and then fell unconscious on the platform. Calhern was lost in the screen of smoke.

"Come on," Tom said, "we've got to get across."

He and Reilly inched their way across, their heads bent against the smoke. Pete held his breath as they grabbed Stumpy by the shoulders and began to bring him back between them along the beam. They had nerve those two, plenty of it.

When they reached Pete, Tom's face was white. "Stumpy's hurt," Tom said. "Terribly hurt. If the top of the forge had come any nearer to him he'd have been killed."

Pete looked back at the writhing flames. "What about Calhern?" he said.

"We didn't see him," Reilly said. "Too much smoke. I guess he got down the ladder on the other side."

Tom began putting Stumpy down when the blood spurted anew from his mangled leg. Pete grabbed Tom's arm. "You two get him down between you," he said. "He'll bleed to death if you don't!"

There was nothing else to do, and Tom and Reilly carried Stumpy toward the ladder while Pete turned to the platform. Just at that moment the wind shifted slightly. The screen of smoke was thinner, more transparent. Suddenly Pete saw Calhern get to his knees. So he hadn't gone down. He'd just been lost behind the smoke screen!

Calhern fought his way forward inch by inch. Then slowly his legs gave way and he slumped forward, overcome by the smoke. Once he tried to lift himself and move forward, but he fell back unconscious. He lay less than eight feet away from the forge that had started all the trouble!

For a second Pete hesitated. Then he tore off his heavy workman's jacket and started across. Calhern would be burned alive in front of his eyes! There wasn't an instant to lose.

When Pete had gone halfway, he sat down with his arms and legs wrapped around the beam. If he were low enough, he might escape some of the smoke which the wind was forcing into his eyes and throat.

As he neared the platform the steel began to grow hot. His skin tightened and the smoke made it agony to breathe.

At the edge of the platform he wavered. He might never reach the forge which was the center of the flames. He stepped onto the boards and by a miracle they held. He rushed past Calhern's body to the one side of the scaffolding that the flames hadn't reached.

Pete shielded his face with his arms and the thick

He flogged at the flames with the coat

jacket and plunged toward the forge! If he caught it just right it might work. If he missed?

The flames curled about him. The heat tore at his shins but he kept on. He could see the black stand of the forge quite clearly through the smoke. He rushed at it and kicked and kicked with his heavy worker's shoes. It moved and moved again. Pete leaned down and shoved with his crumpled jacket and kicked once more.

The forge rolled over and over again. Then suddenly it fell over the side of the platform down, down into the river!

Pete turned and began beating the flames of the platform. Would he have time? Would he get the better of the fire? Had it already gone too far?

He flogged at the flames with the coat, and danced on them with his aching, blistered feet. Once the platform rocked with his beating and for a moment Pete thought he and Calhern would be flung off. He steadied himself and began beating again.

His breath came short and his chest was agony. He could no longer think, only feel. He beat the flames away from Calhern, farther and farther away, until he himself was dangerously near the edge of the platform.

He was just wondering how he could force himself to lift his tortured arms once more when he heard a shout.

"Here they are!" Somebody yelled, "Here are the chemicals."

Suddenly everything went black, and Pete fell heavily beside Calhern.

When Pete came to he was lying in the superintendent's shack at the base of the building. Tom Bryan's face was looking down at him with a grin as detached as the Cheshire Cat's.

"Where are Stumpy 'n' Calhern?" Pete asked through sore lips.

"Right next door in the emergency hospital," Tom said and the room stopped going around at the sound of his voice. "They're all right. The doctor's seen 'em both. Stumpy got cut badly but the Doc reached him in time."

"And the fire?" Pete asked.

"It's out," Tom said. "The chemicals came just when you passed out." Tom moved away just as the doctor came in with Martin, the superintendent on the job.

After the doctor had gone over him Pete tried to speak to the superintendent but Martin was talking to the doctor. "Will he be all right for a new job after a few weeks' rest?" he asked.

"Be fit as a fiddle long before that," the doctor said as he left the room.

In a moment Martin came back and looked down at Pete. "Well Pete," he said and his voice sounded much too gentle for the Big Boss. "That's mighty good news. We're beginning on a new job in a few weeks and we want to be sure you'll be ready to sign up."

"At the same pay?" Pete asked.

Martin shook his head. "No, sir," he said. "Five dollars more a week. We don't want a boy with nerve like yours to be bought off by another company."